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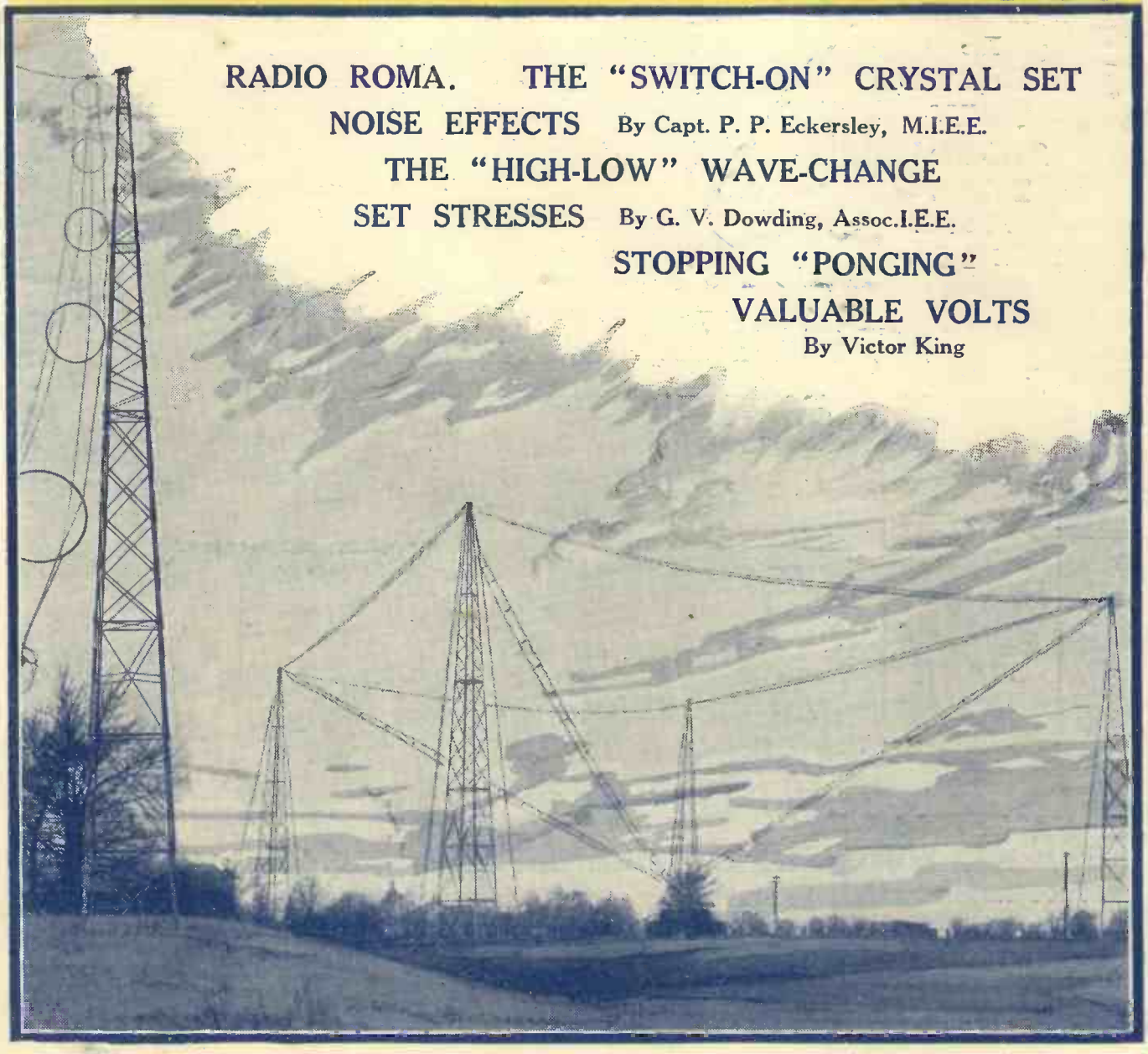
HIGHEST RADIO CIRCULATION IN THE WORLD

# Popular Wireless

Every Thursday PRICE 3d.

No. 413. Vol. XVII. INCORPORATING "WIRELESS" May 3rd, 1930.



RADIO ROMA.

THE "SWITCH-ON" CRYSTAL SET

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THE "HIGH-LOW" WAVE-CHANGE

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By Victor King

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# A PULL — EIFFEL TOWER

# Popular Wireless

Scientific Adviser:
Sir OLIVER LODGE, F.R.S.
Chief Radio Consultant:
CAPT. P. P. ECKERSLEY, M.I.E.E.
Editor: NORMAN EDWARDS.
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A. JOHNSON RANDALL.


NEEDLE NEWS.
A PROPHECY.
MONSTER STATION.
B.B.C.'S GOOD DEED.

## RADIO NOTES & NEWS

CAN IT BE ?
FLYING BOAT RADIO.
BACK TO '27.
MARCONI'S LATEST.

### The B.B.C.'s Chairman.

THE long-deferred announcement of the name of the next B.B.C. Chairman is still unmade at the time of writing, and the delay is giving rise to extraordinary rumours. Some say that the spoke in the wheel is political; others that the "pull" of the candidate put forward by the education party is equal to that of the entertainment party's nominee, the result being an uneasy equilibrium. Meanwhile, does it matter ?

### Radio and the "Trade."

IT is an excellent thing for the public and the radio trade generally that someone has had the hardihood to scream about the large amount of ignorance and tinkering which is rife amongst dealers in wireless sets and "parts." It was all very fine for the plumber, the small electrician, the gramophone-bicycle-flashlamp expert, the chemist and the Hebrew speculator to enter the trade; but they have responsibilities towards their customers which are sadly neglected, and the erroneous advice some of them give so freely must have done incalculable harm to the manufacturers and the public.

### Needle News.

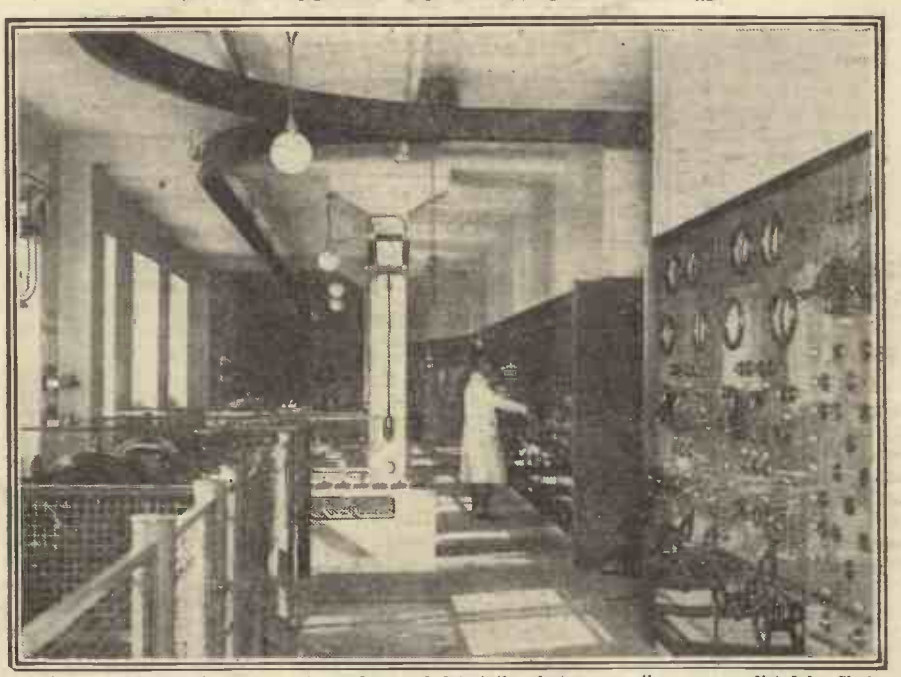
MY Dover correspondent (who calls needles pins) tells me that tungstyle needles, being very thin, reach the track base without resting on the track walls, with the result that the track is deepened, and then the use of another kind of needle brings all the weight on to the walls because the point cannot reach the base.

As to fibre, he says that from the point of view of wear they are the best type, but that he has known fibre to develop such a hot point through friction that the track edge was softened. (How did he know ?) Well, the "scratch" of the metal needle greatly reduces my pleasure and I still favour fibre—on balance.

### A Prophecy to Remember.

THE President of the Radio Corporation of America, Mr. David Sarnoff, has committed himself to the forecast that in less than five years we shall be able to receive images through space as well as we are now able to receive sound through space. Rather unscientifically worded, but none the less interesting because of that. Specially apt in connection with prophecies about television is the saying, "Those who live the longest will see the most."

### A MEMORIAL TO HEINRICH HERTZ.



In honour of Hertz—the first man to produce and detect the electro-magnetic waves predicted by Clerk Maxwell—the Germans have opened an Institute in Berlin equipped with all the latest radio apparatus. Part of the machine-room is shown in this illustration.

### Latest from Paris.

IT is said that, as in Buenos Aires, the broadcasting stations of Paris are going to "flit" to sites outside the city. Radio-Paris will be situated some 20 miles distant. The P.T.T. station, which will become "Radio-Etat, Paris," will probably move to Portoise. M. Lucien Lévy's station "Radio-L.L." is also booked for the suburbs.

The Eiffel Tower station is to be rebuilt as a short-waver for transmission to the Colonies and will cease its telegraphic work on 1,450 metres.

### Distribution of Licences.

THE official Post Office figures relating to the distribution of licences provide some interesting facts. For example, in the Provinces, Lancashire leads with 304,000 licensees, followed by Yorkshire with 250,000. The London postal district contains 541,000 licensees, and the whole of Scotland but 195,000. Rutland has about 1,000 official "listeners," Northern Ireland 30,000, and Wales 108,200. Beds, 20,600; Cornwall, 14,600; Hants, 81,900; Herts, 42,700; Lincs, 47,300; Oxfordshire, 24,800; Staffs, 63,900; Surrey, 106,650; Glamorganshire, 57,200.

### A Monster Station.

THE broadcasting station W G Y, Schenectady, appears to be like Jack's beanstalk, always growing. Four years ago its power was 50 kw.; in two years the power had become 100 kw.; in January last it was 150 kw., and it now boasts 200 kw., with which it transmits on a wave-length of 380 metres. I hear that it has six 100-kw. power valves, each five feet long, and is crystal-controlled, to keep the wave-length from wobbling. And there are any amount of "young W G.Y's" knocking about, for experimental purposes !

*(Continued on next page.)*

# NOTES AND NEWS.

*(Continued from previous page.)*

### An Imperial Service?

AT length the B.B.C. has proposed a scheme of Imperial or inter-Imperial broadcasting, and this has been considered by the Colonial Office. This is progress, indeed, but much water must yet pass under London Bridge before the Empire is properly served, for two matters must be dealt with first, and they are both difficult—finance and the construction of schedules of times suitable for the Colonies. It looks to me as though the Imperial studio will have to work "all round the clock."

### The Radio Critic in India.

I THINK that if you ever stop to read the average column of "radio" criticism you will wonder what useful purpose it serves. However, our critics generally soothe with one hand the stings which they inflict with the other, the result being zero. Not so the "Indian Wireless Magazine," which says what it means and makes "no bones about it."

First, let me quote a piece which seems to indicate that in India as in London "uncles" come and go with astonishing frequency. "Where is Mr. Biren Roy, the young and talented announcer? Has something gone wrong with him?"

### Straight from the Shoulder.

NOW for the blows! "Sj. Krishna Chandra Dey has given us enough of his best. Why not allow him a brief respite? Mr. Abdul Aziz Khan and Sj. Nalinikanto Sarkar should go, and that at once." "Pundit Mullay should pack off to Gwalior for the nonce at the expense of the Calcutta Office." Here is a poetical bit. "Kumari Sadhana Debi is gradually rising to a scholarly empyrean and Miss Pushparani Chatterjee to the dreamy and visionary land of roses and violets." As to Mr. Biren Roy, can it be that he has gone into the salt trade?

### B.B.C.'s Good Deeds.

OUT of the contributions paid by the London and Daventry Radio Circle and money derived from the sale of "silver" paper sent to the B.B.C. by children, the B.B.C. has sent £500 to each of the following: Charing Cross Hospital, Moorfields Eye Hospital, and the Hospital for Sick Children, Great Ormond Street. The donations will endow a cot in perpetuity at Charing Cross, and for 50 years at Great Ormond Street. From funds obtained from the same sources £1,600 has been previously allocated to the provision of radio gear in children's hospitals and children's wards.

### Historical Note.

THE Rev. D. Fraser-Hunt, who has recently broadcast, tells a good yarn. During the war he was at Le Havre with the Y.M.C.A., and one of his many duties was to show eminent visitors round the "sights." One day, when conducting Dr. Nunn, the Head of the Day Training College, they went to the house where Robespierre was born. The door was opened by a "batman." "Is this the house where Robespierre was born?" "Yes," replied Tommy, "he's inside having his lunch!" Dr. Nunn said he would not disturb him; he would prefer to carry away the memory that he could have seen him if he had wanted to!

### Can It Be True?

ACCORDING to the "Evening Star" (Ipswich), a report from New York states that a boy named William Maida has made a crystal set which fits in the eye of an ordinary sewing needle. He had previously made one which fitted the eye of a darning needle, but found it to be too cumbersome. The report is obviously a hoax, and if there is a William Maida he is a naughty boy, and deserves to have his automobile and revolver taken from him! What right has he shoving receivers into the eyes of needles which his elders find it so difficult to thread?

## SHORT WAVES.

**NIGHT THOUGHTS.**

Sometimes I go upstairs to bed,
But, when I lay me down to rest,
There pops into my troubled head
A thought that leaves it sore distressed.

My little bed, my peaceful cot,
Is poisoned by a sudden woe—
Now, did I, then, or did I not,
Turn all the lights off down below?

Therefore I note with grief the way
In which the great Marconi scores;
He 'thinks' lights on by wireless ray
On far Australia's distant shores.

And I am filled with greater gloom
As I reflect that all my prayers
Can't switch 'em on across a room—
Or even think 'em off downstairs!

"Manchester Guardian."

* * *

It is reported that, under certain conditions, sleep can be entirely abolished.

Yes, and since father built his new radio set we know what those certain conditions are, too.

* * *

**WE'D RATHER NOT HAVE IT.**

The lady . . . who listened in for 106 hours without stopping has been given 200 dollars for her trouble. Whether this will pay her lunatic asylum bill or not we don't know, but we do know that just over a dollar an hour is poor pay for so much work.—"Vox."

* * *

Drug Clerk: No, sir, we haven't any Radio Powder in stock. I can't say I ever heard of it. What do you want to use it for, anyway?

Radio Novice: For radio bugs. A friend of mine who is an expert says there's a lot of them in my neighbourhood.—"Radio News."

### Private Flying Boat.

THE HON. A. E. GUINNESS has just bought a three-engined Supermarine Metal Monoplane flying boat. She has a cruising speed of 100 m.p.h., and can carry a crew of three and six passengers. The wireless installation consists of a half-kilowatt transmitter, with a range of 400 miles, for telegraphy and telephony; a direction-finder and two receivers, one for "broadcast." There are two aerials, one a trailer, for use in flight, the other being fixed between the wings. The whole outfit corresponds in power and range to the normal installation on a ship of 5,000 tons.

### Television in Germany.

TELEVISION is occupying more and more of peoples' time and periodicals' space. I suppose that it really will one day grow up, but at present none of my money is in any danger on its account. I hear that determined attempts are being made in Germany to popularise the television transmission of cinema films, and that a public "looking-in" office has been opened in Berlin, where on two Mondays each month "looking-in" to experimental transmissions may be indulged in free of charge.

### Back to 1927.

A READER who does not forget the good of the past in the excellence of the present, calls our attention to the results he is getting from a modified one-valve Reinartz circuit, as described in "P.W." of October 15th, 1927, to which he has added a T.C. L.F. stage, with a P.M.2. Our friend, who lives in Bedfordshire, says that with this set the problem turns from how to rid oneself of the B.B.C. twins, to one of how to find them. He has had Leipzig (259 metres) on the L.S. without a trace of National (261 metres), and can separate Brno, Barcelona, Graz, London Regional, and Stuttgart. Why not get "P.W." Blueprint No. 30, and try this arrangement?

### Broadcast Education.

I LEARN with amusement that one of the intellectual treats which are so generously bestowed upon the American listener was an audition of a "spelling bee" held at Washington between ten newspaper correspondents. Mr. R. Tucker won, beating Mr. R. Luce over the spelling of "kimono." The marrow of the joke is that this champion speller of the U.S.A. spelt "referable" "refferible," a form of spelling which was actually allowed to pass as correct. Still, what does a little thing like that matter? It is not his spelling but his strict accuracy in stating facts which is the American newspaper man's distinguishing quality.

### Marconi's Latest.

DIDN'T the newspapers wax eloquent—non-technical reporter's style—over the Marchese Marconi's pleasing little sideshow when he hooked up the signals from his yacht to a Beam station in England which in turn sent an impulse to Sydney, thus actuating a relay which switched on the lights of the exhibition? The really important part of the demonstration was the two-way conversation that followed, between the yacht and Sydney. That was no amateur's luck, but a tryout of a telephone plant which will cheapen transoceanic conversation.

### A Reassurance.

WOULD you believe it! It has come to our notice that doubts have been expressed as to whether "Captain Eckersley's Query Corner" is indeed the genuine unadulterated product of that gentleman's mind. (A sad blow for us, not because we are doubted, but because we feel that the doubters must be confusing us with the famous "Aunt Sarah's Page," which was supposed to be produced by a stout gentleman who lived on oysters and snuff. Ah well! Here goes!)

I am authorised to state that Captain Eckersley writes every word of the "Query Corner" answers himself—and the doubters can take it from me that there is no "faking" done in "P.W."

ARIEL.

# NOISE EFFECTS

By CAPT. P. P. ECKERSLEY M.I.E.E.

**"So the question before the B.B.C. with their noise effects is to simulate reality, instead of being silly enough to reproduce it. Art is illusion; broadcast drama is supposed to be an art."**

I WAS particularly interested recently to listen to a radio play by a German—the play called, I think, "Brigade Exchange." I think the play was first-class, but the actors could have been more convincing. That, by the way. What I found particularly to criticise was the noise effect intended to represent a bombardment in the distance.

I offer the following advice, free gratis and for nothing to the B.B.C. Production Department. I hope my readers will find my advice of some interest, even though no one takes any notice of free advice.

Now my first and fundamental point is that we cannot make a big noise, i.e. a noise of great intensity, via broadcasting; there are limitations. The restricted throat of the loud speaker can do no more than give a maximum sound.

To get a contrast between these breathless but altogether too fascinating interval pianists who have "just played" and the simulation of two liners running into one another head-on at 30 knots each in a typhoon, one could only hope to diminish the feeble; one cannot, beyond a maximum, increase the strong.

### Difficulty of Contrast.

To get contrast, one must weaken the transmission. This means, however, introducing background noise of carrier-wave, if nothing else. If modulation is diminished, lots and lots of receivers get nothing. So the B.B.C. cannot get contrast in loudness beyond certain limits.

The whisper of the timid is the same intensity as the bawling of the self-assured; the buzz of a teasing gnat agitates the peak voltmeter as much as the engine noise in the cockpit of a fighting aeroplane. This is the fact that the B.B.C. has to face, somehow.

If, of course, given "perfect" reception and "perfect" co-operation, we could expect the receiver to have such a reserve of power as by the turning of a handle to bring up the big bang to its reality, or to diminish the coyness of a comedienne to the right degree of raucousness to make it natural, one would be satisfied. But (1) we shall not have that co-operation; (2) we have not yet got the receiver essential to such co-operation; (3) in composite broadcasts, where the mutterings of Lear are the foreground of a thunderstorm, we must rely upon B.B.C. "balance."

So the question before the B.B.C. with their noise effects is to simulate reality, instead of being silly enough to reproduce it. Art is illusion; broadcast drama is supposed to be an art.

Thus, going back to our bombardment, we have to give the effect of shells near-by and far away. Now one of the first

## "SYNTHETIC" SOUNDS.

Some of the elaborate mechanism used by a German station to develop noises for broadcast dramas. This particular machine generates sounds similar to those made by big ships.

points to get hold of is that, either with the microphone or with the ear, *distance* lends enchantment. I heard the Silvertown explosion in London during the war.

### The Silvertown Explosion.

A distant, menacing, window-shaking rumble it sounded, and I started and said, "Phew, what a terrific explosion!" But the *intensity* was not great.

So you never can get through the microphone a big enough intensity to make you say, "What a huge noise!" and you can never simulate a big intensity by amplifying a feeble noise near the microphone. Your whole object should be to proportion distance to, actually, a loud noise. I therefore criticise a bombardment simulated by the loud noise of rattling a tin plate near the microphone; I suggest instead the introduction of reverberation and distance. I do not know, but suggest that if the tin plate were rattled very hard at the end of a long corridor, and the microphone placed at the other end of the corridor, one would get nearer to the simulation of reality.

In the particular play I spoke about, the bombardment comes nearer and nearer. But there was no deep rumbling menace in its approach; it sounded more like an approaching lorry carrying tin plates through a Manchester cobbled street.

Individual shells were better, but again the shriek of their approach was too much individualised. One wants three or four different whistles at a distance to give the multitudinous effects of the several whistles really emitted by a shell. The aeroplane bombs were very poor, and all because they were too individualised; distance had not had time to soften the outlines and give the feeling of bigness and the release of shattering destruction. Directly you individualise a sound by its too close photography it becomes, in reality, the sound itself, and a bombardment becomes a ridiculous picture of a harassed shirt-sleeved person with a whistle, a drum, and a dice-box. One, pheem; two, booomp; three, tickle-tackle-tockle.

### A Sound Suggestion.

If the same noises, softened by reverberation, blurred in outline by different attenuations, arrived at the microphone with their phases mixed, one might hear the rush of the approach, feel the sickening pause, hear the menacing dull, soft corump, and listen to the bits whee-e round, dealing indiscriminate death as they go.

Different distance gives an amazing character to the same sort of sounds. In the drama people want to realise that more. All characters might well keep uniform but different distances from the microphone during a dialogue, and so give point to some situation.

One thing must be everlastingly forsworn, and that is the attempt to build effects in crescendo in terms of pure intensity. It's the quality alone that counts, and that quality can be amazingly varied by a variation not of intensity, but of distance. The productions business does seem to hang fire over certain elementary points, and this—but it is not the only one—seems one of them.

# BIRMINGHAM & THE B.B.C.

## A COMPROMISE.

**By THE EDITOR.**

THE B.B.C.'s decision with regard to the Birmingham Studio Orchestra has, apparently, not been affected by the petition which listeners in the Birmingham area are getting up to present to Parliament, protesting against the B.B.C.'s policy. The B.B.C. has announced that one of the results of the rapidly improving technical conditions of broadcasting is the gradual re-arrangement of orchestral work, necessarily involving reductions in the existing studio orchestras in provincial towns.

It is stated that the Octet which took the place of the Glasgow Studio Orchestra has now been in existence for six months, with results which can be termed satisfactory. And consequently, in pursuance of its policy, the B.B.C. intends to replace the Midland Wireless Orchestra by an Octet in the autumn of this year.

### Additional Concerts.

We understand that an arrangement has been made whereby the City of Birmingham Orchestra will give additional concerts during the six months' season and, to enable this to be done, the B.B.C. has promised increased contributions in return for broadcasting facilities, and has also guaranteed a certain number of engagements of this orchestra for broadcasting purposes.

The Octet to be formed will be a Studio Octet, as far as possible made up from members of the old orchestra. The remaining members of the present Studio Orchestra will receive sympathetic consideration for their inclusion in the City of Birmingham Orchestra by its new musical director, Mr. Leslie Heward, in collaboration with Dr. Adrian Boult, who is now Musical Director of the B.B.C.

The B.B.C.'s decision has not been very warmly welcomed in the Midlands, and there is a considerable amount of criticism to the effect that the B.B.C. is still dictating to Midland listeners.

According to the Birmingham Gazette, Midland listeners have made it quite clear that they do not want a lot of highbrow music, that they prefer the music of a light popular character that the studio orchestra has been in the habit of giving.

### Conferences in the House.

The Gazette goes on to say that, so far as this is a victory for anybody, it is a victory for Dr. Adrian Boult, the former conductor of the City of Birmingham Orchestra, and now Musical Director of the B.B.C.

It is pointed out that the chief danger of the B.B.C.'s new scheme is that there will not be enough provision for those who like the lighter forms of music. The B.B.C. should have waited for the protest by Midland listeners to be brought up in Parliament. The Birmingham Gazette states that the B.B.C. is not giving full weight to what the public wants, as expressed in the petition and throughout the campaign. Another meeting is to be held to decide what future action shall be taken with regard to the Midland campaign, and the petition of protest in Parliament.

It looks as though the B.B.C. has done its best to forestall the organisers of this protest. Certainly it is not in the B.B.C.'s interests that the petition should be brought up in Parliament. "In effect, the B.B.C. tried to make out that it has benefited everybody, whereas it has benefited only a small number of concert-goers in the Birmingham area only, and has caused a great deal of harm elsewhere," says the Birmingham Evening Dispatch.

"It may not be realised," said Mr. W. Whiteley, M.P. for Ladywood, in a recent interview, "how many conferences and discussions there have been on the matter among members in the House of Commons.

"I have seen, and discussed the matter with, the Postmaster-General, who has pointed out the difficulty of getting at the B.B.C. through questions in the House of Commons.

"It seems to me that when the constitution of the B.B.C. was originally framed it was deliberately arranged that there could be no Parliamentary interference on questions of policy.

"Certainly those members with whom I have discussed the matter would be willing to accompany a deputation of petitioners to the Director-General of the B.B.C.

"I am against the disbanding of the Studio Orchestra or any interference with the musical amenities which wireless listeners at present enjoy from the Birmingham Station."

## ON THE "ELETTRA."

Some of the valves used for transmission by Marquis Marconi in his recent relay experiments with Sydney, Australia.

### The P.O. Detective Van.

Listeners should keep a sharp look-out these days for the Post Office Wireless Detective Van. This van is making a tour of some of the big centres in the country with the idea of smartening up those backsliders who have installed wireless sets without taking out wireless licences.

The other day the van was in Manchester, and its moral effect was so great, it is reported, that the very sight of it touring round the main streets, attending football matches or lounging about outside business offices, factories and schools, resulted in a sudden boom in wireless licences. So much so, in fact, that the Post Office reports an increase of 30 per cent.

This wireless direction-finding van does not seem to rely on the efficiency of its apparatus for locating oscillating sets, but rather upon its forbidding aspect. The van can't be missed, and it certainly does seem to play havoc with the nerves of those backsliders who have refrained, either from loss of memory or for other reasons, from taking out licences.

### Have *You* Forgotten?

As our readers know, magistrates are inclined these days to be rather severe with radio licence defaulters, and it is certainly not worth while being fined £5 because one has not taken out a 10s. licence for broadcasting.

Our advice to all of our readers who have so far forgotten to take licences, is to get busy and take them out right away.

Newcastle has also been visited, and we understand that, district by district, this van is going to make a tour of the country. After all, the Post Office, the Treasury and the B.B.C. must have money, and the B.B.C. must receive its revenue in order to carry on.

The following figures denote the number of licences per thousand population in some of our largest centres:

| | |
|---|---|
| Bournemouth | 154 |
| London | 81 |
| Aberdeen | 77 |
| Liverpool | 67 |
| Sheffield | 63 |
| Manchester | 59 |
| Nottingham | 58 |
| Dundee | 57 |
| Edinburgh and Cardiff | 55 |
| Glasgow | 46 |
| Newcastle-on-Tyne | 45 |
| Belfast | 38 |

# VALUABLE VOLTS

## by Victor King

YOUR L.T. supply hands you two, four or six volts of electrical pressure for pushing electrons through the filaments of your valves. The filaments put up a fight, but although their resistances or opposition to the "juice" are comparatively high, the pressure suffices and the required heat is generated.

The H.T. battery or mains unit will give you a hundred or more volts for the anodes of your valves. And even the grid-bias battery can hand out six or seven or more volts.

When you compare any of these with the voltage developed on your aerial by a broadcaster you will realise two things: (1) that the received energy is mighty small, and (2) that a big set is a wonderful thing to be able to shake a room with dance music brought to you on wings of such gossamer lightness.

Each of the Brookmans Park transmitters manages to get some 40 k.w. of energy into its aerial.

At ten miles distance such a station will induce in a good receiving aerial of the outdoor type four or five billionths of the transmitter power.

### Not Much Margin!

Wherever you are, lest you be right in the shadow of the Brookmans Park aerials, you can count yourself lucky and reckon your outfit good if you get much more than a fifth of a volt of H.F. energy in your aerial.

Radio Roma, the new 50 k.w. broadcaster of Rome, might manage to shake a good English aerial with about a hundredth of that, providing conditions for distant listening were good.

When you have only a fraction of a volt to play with there is no margin for incidental and accidental voltage drops of more or less serious natures.

Any radio receiver will be full of odd resistances wasting perfectly good juice, but many will matter but little. For instance, the leads to the H.T. battery will be dropping a fraction of a volt, but what is a fraction of one volt where so many tens of volts are concerned?

### Small to Start With.

Ditto, the L.T. loses a bit of its pressure in its connecting leads, however thick these wires may be, though here again the wastage will not affect the working of the set unless it is excessive.

But your aerial H.F. energy is small to start with and won't stand much pruning.

Of course, Brookmans Park gives you pretty well as much as you want wherever you are in London, and if you have anything of a set at all, there will be a bit to spare.

But Brookmans Park is one of the exceptional programme providers, and it is a very different story with the more distant stations or with those that are less powerful.

**Some plain words about selectivity and the general efficiency of a receiver by a famous set designer who is noted for his outspoken but sound views on modern radio.**

People living in Manchester, Glasgow, Aberdeen, Belfast, Cardiff and other such places can have no conception of the "beefiness" of Brookmans in London, and the way he pushes his way past those not-too-good wave-traps.

And if you are a Londoner who listens only to London you haven't got to worry about a little wastage of H.F. energy—you are probably trying to waste a good bit by shortening your aerial, or even discarding your aerial in order to achieve "separation."

### Tiny Impulses.

Those whose stations deliver tiny impulses must pay tribute to Professor Ohm and remember the importance of his Law.

But you DX folk shouldn't pay too much attention to the low-loss crank. Cut down your H.F. losses by all means, but do it at the right places!

Don't worry overmuch about your aerial and earth connection—it is the coil in the aerial circuit and in the grid circuit of your first valve that deserves the closest attention.

Get a fairly good aerial (the higher it is the more volts you will get induced in it), and then proceed to unload it from the grid circuit of the first valve.

The vital point to remember is that whatever you do you won't be able to achieve an aerial system that won't lie like a ton of bricks on the grid circuit of the valve if it is joined right across it, and cause great damping and terrible inselectivity.

### Not a New Scheme.

I've no time for the shorten-your-aerial plea of the rabid "selectivists." I say, put up a good, fat, high wave-stopper and then guide the consequent respectable energy into the set via voltage-stepping-up couplings sensibly arranged; not via juice-wasting pseudo-selective stunts.

The X coil is a fairly good scheme, but the tuned aerial circuit loosely coupled to the tuned-grid circuit is better, though it calls for a second tuning control.

Curiously enough we were using this scheme fifteen and more years ago!

There are other ways of doing the trick, and you meet them in "P.W." set designs. To those who have sets that receive confused mix-ups of stations, I would say, don't tinker about with "brute-force" selectivity schemes and haphazardly designed rejector and acceptor radio energy eaters, use something scientifically sensible, such as the famous "P.W." Brookmans Rejector, or build a new set.

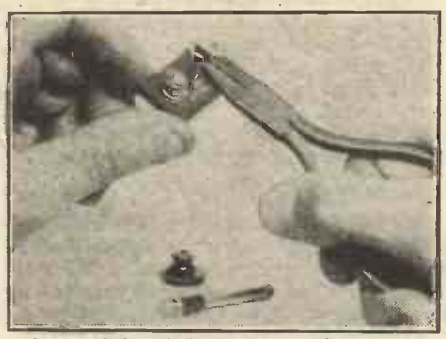
### The Brookmans Rejector.

Listeners who have manufactured sets that are not selective may be tempted to achieve the necessary selectivity by cutting down the efficiency of their aerial arrangements, but to do so is to waste valuable energy.

There isn't much of that valuable H.F. "juice," although, as I have indicated, there will be ample for the Londoner to receive London at loud-speaker strength on a two or three-valve set.

If the foreigners are wanted as well, then other steps to achieve the desired end must be taken. And even the completely non-mechanical listener can hook up and use a "P.W." Brookmans Rejector.

### A SWITCH TIP.



**Faulty switch contacts often mean serious trouble. If you suspect that one of your switches is not working properly, dismantle it, clean the contacts, and bend the springs in slightly, as shown in this photo.**

LATEST BROADCASTING NEWS.

# TROUBLE AT SAVOY HILL.

## NEW MUSIC FROM BIRMINGHAM—ULSTER TAKES FREE STATE RELAY—SPECIAL PERFORMANCE OF "ELIJAH," Etc.

THE delay in the appointment of the new Chairman of the B.B.C. produces an atmosphere of uncertainty which accentuates differences of opinion and conflicts of personalities at B.B.C. headquarters.

It is believed that the present position is one of acute tension, and apparently it is only with the most anxious endeavour that a public outbreak is being avoided. Apart from the existence of grave trouble, its specific cause or nature is not known.

Meanwhile the work of broadcasting is unaffected, which goes to support the view that it does not matter much what happens to the higher command at Savoy Hill. Betting on the Chairmanship Stakes is weak; there being singularly little to guide the punters.

Nor are the bookmakers putting themselves out to encourage transactions. The situation is too nebulous and obscure to promise a reasonably balanced market. Backers of Mrs. Snowden are still confident, although their numbers have not been appreciably increased.

Some interesting wagers have been laid on the Prime Minister's attitude. Mr. MacDonald is, of course, a close personal friend of Sir John Reith, and he is being urged to make Sir John executive chairman.

It is more likely, however, that the appointment will go to someone whose name has not yet been canvassed with confidence. Mr. Geoffrey Dawson, Editor of "The Times," could have the job if he would take it. Lord Hailsham is another newcomer to be fancied.

### New Music from Birmingham.

Listeners have been led to expect at least one first performance of a new work each week in the programmes arranged at the Birmingham studios. The officials there seem to have set themselves a standard, and it is interesting to see how long they will be able to maintain it.

At all events they are safe until Saturday, May 10th, when Norman Demuth will conduct the first performance of his No. 3 Pianoforte Concerto and his "Pagan Dance Suite." The soloist in the Concerto will be Cyril Smith.

### Ulster Takes Free State Relay.

Another relay from the Irish Free State will be heard by Ulster listeners on Saturday evening, May 10th, when a Vaudeville programme will be taken from the Capitol Cinema, Dublin.

It is too early to give details of the broadcast, but when it is stated that the theatre has an orchestra of twenty performers and a permanent troupe of twelve Tiller girls, listeners can rest assured of an enjoyable programme.

On the same night Belfast listeners will also hear a sketch entitled "A Pennyworth of Peppermints," and some dance music by Sibbald Treacy's Rhythm Kings.

### Special Performance of "Elijah."

Muriel Brunskill, Stiles-Allen and Keith Falkner are the soloists in a special performance of "Elijah" which the B.B.C. is giving in the Queen's Hall on Friday, May 23rd. The National Chorus and Wireless Symphony Orchestra will take part, and the performance will be broadcast.

### Isle of Man Features.

An important day in the literary history of the Isle of Man falls on Monday, May 5th, when the centenary celebrations of the birth of T. E. Brown, the famous poet and schoolmaster, will be marked in various ways not only in Douglas, where he was born, but also at Kirk Braddan, where he spent his boyhood.

Brown, who was the son of a clergyman, wrote many works, all of which reflect a fine character and a love of what was best, but in England he was probably better known as a schoolmaster at Clifton College, where he served for thirty years.

The centenary will be the occasion of a special broadcast programme for Northern listeners, in which Manx music and readings from Brown's works will be heard, the latter being given by Mr. W. L. Clague, one of the organisers of the centenary celebrations.

The music, which will be played by the Northern Wireless Orchestra, will include a Manx Suite and a Manx Rhapsody by F. W. de Massi Hardman and a Manx Suite by Tootell. Appropriate songs will also be sung by Muriel Brunskill.

## A TELEVISION TEST.

Miss Gracie Fields and Miss Annie Croft were recently "televised" at the Baird studios at Long Acre, London, W.C.

### National Orchestra of Wales.

The National Orchestra of Wales is opening a summer series of concerts at the Pavilion, Llandaff Fields, on Sunday evening, May 4th. It will be remembered that last year large audiences were attracted to the Pavilion, a fact which has induced the organisers to arrange an even more ambitious season. The concerts will, of course, be broadcast to listeners in the Western Region.

# FOR THE LISTENER.

**A Specially Contributed Criticism of Current Broadcasting Events. By "PHILEMON."**

**Who will long be remembered for those wise and witty broadcasts entitled "From My Window."**

IT was very trying to listen to Norah Blaney's Cocktail Party and hear them handing round the side-cars and the maiden's dreams. It sounded a jolly party.

Flotsam and Jetsam were there, and Irene Russell as amusing as ever, and Billy Mayerl playing bright things on the piano, and Norah Blaney a host as well as a hostess in herself. And I enjoyed it, too; but I wish that there had been some way of handing me a side-car through the loud speaker.

### Mahler's Eighth.

It had been boomed a lot. We had been allowed to listen one night to the chorus practising, as a Surprise Item. I think it came up to expectations, and provided a magnificent finish to the present series of symphony concerts. It was great music, there can be no doubt.

I thought the first part easier to understand, but the second was the lovelier. The theme of the first part was simple—the praise of Love which raises us to knowledge and felicity. The music, with some pretentious moments, was profound; it spoke of human hopes and fears, dreams and agonies.

The triple chorus was magnificent, and its effect towards the end of the first part, as it rose to a long paean of joy and triumph, was very impressive.

### Happy Music.

All the same, I got more pleasure out of a smaller recital in which Andre Mangeot and Lyell Barbour played Mozart's Sonata in F, and Ben Davies sang "Where'er you Walk." After the excitement of Mahler, and the weirdness of Schönberg, I felt something like one feels after a holiday in Switzerland or the Tyrol when one comes up in the train from Dover through the green pastures of a familiar land.

### Black Dyke.

I also have a peculiar fondness for brass bands, and the Black Dyke *is* a band, if you like. In the village where I lived as a youth there was a brass band which played the Morris dance up and down the streets at Wakes time.

Old memories are very tenacious. In those days I aspired to play the trombone, which seemed such a full-blooded, cheek-

(*Continued on page* 216.)

# The "SWITCH-ON" CRYSTAL SET

**An easy-to-make receiver which gives you an immediate switch-over from one to the other of the alternative programmes.**

**Designed and Described by H. BRAMFORD.**

THIS very simple little receiver was originally designed to take advantage of the alternative programme service available in the London area from the old 2 L O and 5 G B.

In that capacity it gave such excellent service with the very minimum of attention that it is thought readers would be interested in a version specially prepared to take full advantage of the new Brookmans Park twin transmissions.

In its new guise it is just as simple as ever, easy and inexpensive to make, and gives excellent results. It is very well suited to enable all readers who are not too near to Brookmans Park to take full advantage of the new service.

**PARTS NEEDED.**

- 1 Panel 6 in. × 8 in.
- 1 Cabinet to fit with baseboard about 8 in. deep. (Any generally similar dimensions can be used provided the lay-out is treated with due respect.)
- 1 ·0003-mfd. (maximum) compression type semi-variable condenser (Formo type J, or Igranic "Pre-set," etc.).
- 1 ·0001 mfd. (maximum) compression type semi-variable condenser (Formo type F, R.I., etc.).
- 1 Set of parts for panel mounting double-pole change-over switch. (If difficulty is experienced in obtaining these, a complete switch can be used, e.g. Wearite, Dubilier, Utility, etc.).
- 1 Crystal detector, mounted on ebonite strip (Gecophone, or similar type is suitable).
- ¼ lb. No. 24 D.C.C. copper wire, Glazite, flex, 3 tapping clips, 4 terminals, coil former, etc.).

Of course, it must not be expected to separate the two transmissions at very short distances, for to do that you really require something very special in the nature of a "P.W." rejector scheme.

### A Simple Scheme.

The essence of the idea is very simple indeed. We have a coil with suitable tappings to give auto-coupling for the aerial and a crystal tap, and a simple wave-change switching scheme.

This last takes the form of a double-pole change-over switch on the panel and besides bringing an additional semi-variable condenser across the coil for the 356 metre wave also shifts the aerial tap.

Now let us get down to business and look over the constructional work. Start the job by drilling the panel. This operation is quite simple, and should not take long, all the dimensions except those for the switch being given in the diagram.

If a switch of the panel-mounting type is used, a drilling template will probably be supplied by the maker. If any other type of switch is used the drilling details should be arranged accordingly.

When this operation is completed, secure the panel to the baseboard by means of three countersunk wood screws, then assemble the terminals and switch.

### Very Easy.

Turning our attention to the baseboard, the vari-condensers $C_1$ and $C_2$, together with the coil and detector, are mounted in the positions indicated in the diagram which shows the back of panel and the baseboard.

Before we can complete this, however, it will be necessary to construct the coil, which is an easy matter.

On the actual receiver a skeleton former was used, having a diameter of 3 in. An ordinary ebonite or cardboard former of a similar diameter will also suit the purpose quite well.

To wind the coil, secure the beginning in any convenient manner (a terminal could be used, if desired). Put on 15 turns and then at every fifth turn make a tapping, and complete the winding at the 55th turn, securing the finishing turn firmly. A connection is also required at the 15th turn.

When the coil is finished, secure it to the base-board in the usual way. It will be seen that the detector is fixed across the top of the former, a wooden cross-piece being fitted into the end of the tube as a support. (The idea of putting the detector inside the cabinet is that it is less liable to be knocked out of adjustment).

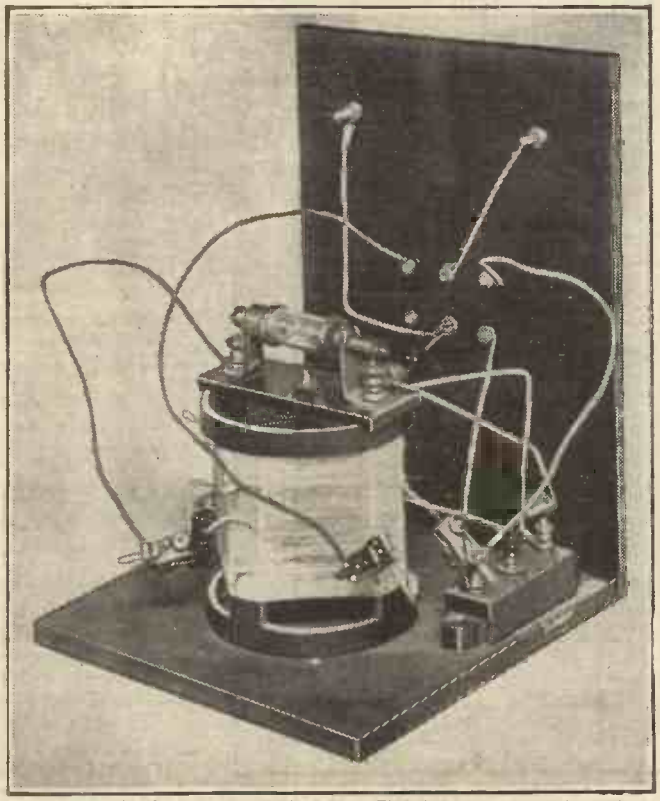
### Setting the Set.

There is little to be said about the wiring of so simple a set, and the diagram should be sufficiently self-explanatory.

Now after this simple constructional work is completed, we are ready to set the receiver permanently for the reception of the upper

(*Continued on next page.*)

## BEHIND THE PANEL.



The tuning is all of a pre-set character. That is to say you adjust the apparatus once and for all, and then pick and choose your programme alternatives merely by operating a simple panel switch.

## THE "SWITCH-ON" CRYSTAL SET.

*(Continued from previous page.)*

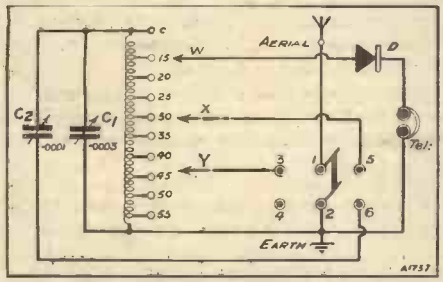
and lower wave Brookmans Park transmissions.

Just a little patience may be required by the beginner in setting this receiver, but in view of the fact that once set it is finished with it is well worth the trouble.

I think the best method is as follows: First throw the switch over for reception of the lower wave, that is, to the side marked Points 3 and 4.

Ignore the detector tap entirely to commence with and secure the clip W to the

### A SIMPLE CIRCUIT.




When the switch is thrown over to the one side it brings in the higher coil tap and extra capacity ($C_2$) necessary to bring in the higher-waved station.

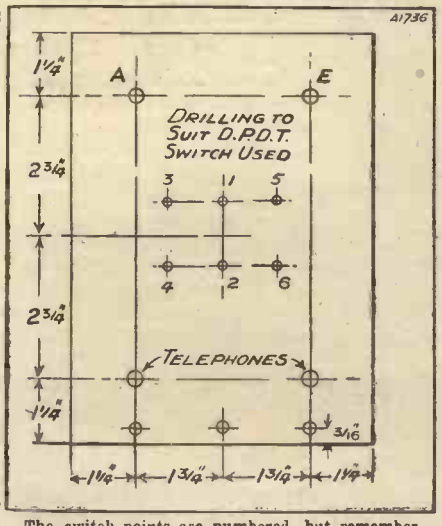
beginning of the winding, O. Now set the aerial tap Y about 10 turns from the earth end of the coil, which would be on No. 45. Set the detector and carefully adjust by means of the centre screw the condenser $C_1$.

**The Higher Wave-length.**

When signals are heard, readjust the detector to its best, and then leave it alone. Proceed in this manner until the very best results are obtained from the local station, trying different taps, always keeping the aerial tap some few turns above the earth tap.

Next, change over the switch to 5 and 6. The other aerial tap, X, should now be

### NOTE THE NUMBERS.



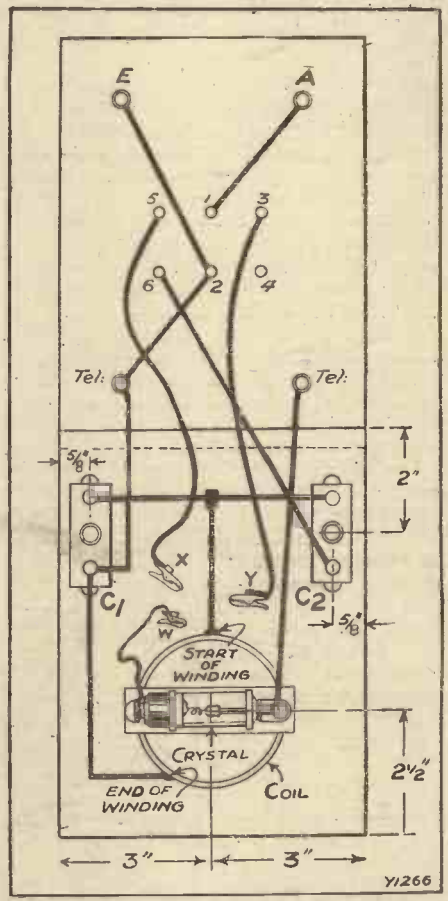

The switch points are numbered, but remember this panel-drilling diagram shows the front of the panel, and not the back as does the wiring diagram.

placed some little distance above the aerial tap Y and tuning should be done on $C_2$. It is possible the 261-metre wave will still be heard faintly; to cut it out, the procedure is as follows:

Do not trouble about the aerial tap Y, as this is already fixed. The whole thing depends upon the position of the tap X. Adjust the condenser $C_2$ until the alternative station is heard, making the final adjustment with the aerial tap for the best results.

If this work is carried out properly we may consider that the set is permanently fixed, and if desired the clips can be removed and permanent connections made in their place.

### A DOZEN LEADS.




There are only about twelve little leads to connect up, and the set is ready for use.

## SOS
## HOW IT ORIGINATED.

**By J. F. CORRIGAN, M.Sc., A.I.C.**

THE precise origin and history of the famous distress call, "SOS" has puzzled many an enthusiastic radio amateur. How, one often hears asked, did those now-celebrated letters come to be accepted all over the world as the acknowledged radio call-sign for a ship in dire distress at sea?

It would appear that the first suggestion of a distress call for vessels at sea was thrown out by a party of Italian delegates who attended a conference on Wireless Telegraphy at Berlin in 1903. They suggested the universal adoption of the signal, "SSSDDD," to be employed by ships in cases of emergency, and they advocated, also, the formulation of a number of rules governing the use of such a distress call.

Not very long after this suggestion had been broached, the Marconi Company, recognising the vital need for some type of distress call, instituted its at one time well-known "CQD" call on all its ships, the signal being a combination of the Company's general call, "CQ," with the addition of the letter "D," which signified distress.

**When "C Q D" was Used.**

The instructions of the Marconi Company were that the signal "CQD" was to be used only at the order of the captain of a distressed vessel, or by a land station re-transmitting the signal. Radio operators who abused the call were to be dismissed.

Another radio conference was held in Berlin in the year 1906, and during the sitting of that body, the German Government put forward the suggestion that a universally standard distress call for ships at sea should be adopted. The German Government further suggested that the distress call "SOS" should be made use of.

Why, it may be asked, were the letters "SOS" suggested for an international distress call?

At this period, German ships desiring to communicate with all vessels in their neighbourhood would, particularly if the names of such vessels were unknown, transmit an inquiry call "SOE," or, in Morse, . . . — — — .

**The Final Signal.**

The adoption of this call signal as an international marine distress signal had first been considered, but it was obvious that the signal was not distinctive enough, the final letter "E" being represented mercly by a dot, which could easily be overlooked in times of atmospheric disturbance or of heavy radio traffic.

For this reason, therefore, the distress call, "SOS" (in Morse . . . — — — . . .) was submitted for the consideration of the delegates to the Berlin Conference of 1906. It was adopted officially, and it was put into effect by the International Radiotelegraphic Convention of Berlin in 1908.

Thus the very apt interpretations, such as "Save our Souls" and "Save our Ship," which have been put on the "SOS" distress call are untrue.

It was a matter of much regret to the old Marconi operators that their old signal, "CQD," had not been adopted as the international distress call. Indeed, many of these operators continued to follow up their "SOS" signals with "CQD." Gradually, however, the latter signal was relinquished, and now it is almost forgotten.

**Before throwing away an old flashlamp battery it is a good plan to remove the brass strips, as there are many uses to which they may be put.**

* * *

**For accurate tuning on a short-wave set, or a wave-meter, there are many advantages in mounting a small magnifying glass over the tuning dial scale and pointer.**

* * *

**'Phones should never be supported by their cords alone.**

# STOPPING "PONGING"

By P. R. BIRD.

**If you have ever been troubled by a set which "rings" when you walk across the room or roars when the loudspeaker is placed too near, you will be interested in this article on the cause and cure of "ponging."**

PONG! Pong! Pong! Not Big Ben striking three o'clock, as you might imagine, but three sonorous sounds caused by taking three ordinary steps across the room! That is the trouble with a "ponging" valve set; every movement in the room is liable to sound like the delivery of a ton of coals!

Sometimes the trouble does not occur unless the set itself is touched, though even a slight bang of the cabinet sounds like the crack of doom in the loud speaker. Or, in other cases where the trouble is not so pronounced, it is the changing of a coil, the pulling out of a valve, or some equally necessary operation that produces the "pong."

### The Rush for the Switch.

If you have not been troubled with one or other of the above, perhaps you have had experience of another branch of the same family? In this instance you may not notice the thunderous footsteps, or a bang when the coil is replaced, but you sometimes get a peculiar built-up howl that in its final stages almost rocks the neighbourhood.

Usually, in such cases, the programme goes merrily enough for a time, but suddenly the loud speaker starts to "ring" a little on one note, and once this has started it rapidly builds up and builds up louder and louder into an intolerable howl, that only ceases when the set is switched off.

Switch on again, and you find that everything is just as it should be, and so the programme goes on again without a trace of trouble until, without warning, there is another "pong" from the loud speaker, another moment in which it is gathering its voice for a great effort, a rapidly rising roar, and another rush for the switch! When this happens, can you wonder that worried set-owners go about asking one another what are the best means of stopping "ponging"?

### Those Minute Movements.

In order to put this fault right, the set-owner must realise what causes it. Why should a light footstep on the floor or a tap on the set be translated as a tremendous thunder-clap? Why should a decent and well-behaved set suddenly start to roar like a lion seeking whom he may devour? The answer to both these questions is—microphonic valves!

Nowadays, everybody interested in wireless knows that inside each valve is a thin wire called the filament. When heated by the L.T. battery, this filament emits the electrons that form the plate current of the valve, and enable the set to reproduce the speech, music, etc. Normally, the current flowing through the valve is controlled by electrical charges on the grid which is placed in a strategic position close to the filament. The relative positions of the filament and the grid—that is to say, the distance between them—is important; and, so that it shall not vary, both grid and filament are suspended inside the valve by metal supports. Unfortunately, as these electrodes are "springy," they may have a tendency to vibrate. This is fatal, for the slightest movement will disturb the normal working of the valve by momentarily altering the relative positions of the grid and filament. If this happens, and shocks from outside the valve can succeed in shaking its filament, the valve is said to be "microphonic." And in this condition it will "pong."

If you possess such a valve, remember that the effect is most noticeable when you attempt to use the valve as a *detector*.

### How it Howls.

The most obvious and best cure is that adopted by the makers of the anti-microphonic valve holders. Here the actual base into which the pins of the valves fit is cushioned by springs, and consequently slight shocks to the set either do not reach the filament, or are very greatly reduced. With such a valve any form of shock-absorber is helpful in curing the trouble, so it often disappears altogether when the set is supplied with rubber feet, or placed on a thick woollen mat, or separated by any effective shock-absorber from the source of disturbance. In the case of the built-up howl it may at first appear difficult to see where the disturbance is coming from, but examination will show that it is the loud speaker itself that is setting up the unwanted vibrations. When it is placed upon the set, or even when it is turned so that the sound waves from it impinge on the valve, any loud and prolonged note from the loud speaker is liable to shake the electrodes, and to start off a vicious circle of cause and effect.

## WHY "PONG" IS PRODUCED.

The enormous amplification developed by the modern receiver is one fundamental cause of "ponging." If any trace of the output is returned to the input stages it is magnified tremendously, and so aggravates the feed-back.

### Cause and Cure.

For as soon as the filament is shaken by the note it begins to shake, and this sets up that note with greater vigour in the loud speaker. This naturally leads to a still greater shaking of the filament, which in turn produces an even greater howl. In this way the note builds itself up, and grows as it feeds! The only cure in all such cases is to keep the loud speaker further away from the set, or to "cushion" the valves (cotton-wool is very good) to protect the electrodes from being shaken.

Naturally, the method will vary with different sets, but this is the heart of it, and in these ways you can always succeed in stopping "ponging."

### SWITCHING FOR THE "MAGIC."

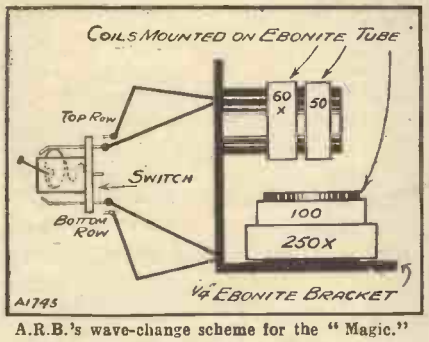
Dear Sir,—Re "Magic" Three. In your issue of March 1st, on page 1254, I notice a letter from "B.G. (Cowley, nr. Oxford)" regarding using the above set with run-down H.T. batteries He may be interested to learn that I myself have found the set to be absolutely stable when using an old 100-volt "Lissen" battery, giving now only 50-volt overall.

The set runs with this 50 v. on H.T.$_2$ and 35 v. on H.T.$_1$, with potentiometer arm set about half way round, reaction is quite smooth and can be set quite close to the oscillating point without "plopping."

Range and power are, of course, reduced but even then Buda-Pesth can be got at comfortable loud-speaker strength. Valves are two volters, Cossor H.F. for $V_1$ and $V_2$ and Cossor small power for $V_3$, and I have an extra 2-mfd. condenser in parallel with $C_3$.

In the same issue I notice letters regarding coil changing, p. 1262, from "W.B. Cumberland (Bristol" and "E. Williams (Llanelly)," on p. 1263. I have tried a number of experiments to get over this, as the receiver is for family use, and I wanted to simplify as much a possible and avoid particularly the connection to the tapping points on the X coils.

The 6-pin base method is all right, two terminals for the tapping points, one for earth end of tuning




A.R.B.'s wave-change scheme for the "Magic."

coil, one for grid end of the same coil, and two for the reaction coil.

I mounted the coils as indicated in the sketch with the terminals on the base belonging to the tapping points connected to sockets mounted on an ebonite strip with plug on flex connected to aerial terminal of set. The coils can be changed therefore without disturbing this flex lead.

The coils must, of course, be dismounted and the ends taken direct to the pins on the bottom bar of the ebonite frame. I have now discarded the above arrangement in favour of a switch-operated system. I tried using a former with long and short-wave coils and a common reaction between but didn't get good results.

It might be possible, but my time for experimenting is limited so I tried the method indicated below; bulky but effective. The short-wave coils are connected to the top row of contacts and the long-wave coils are connected to the bottom row, the middle row, of course, go to the relative points in the set, the tapping points two sockets on the top of the arrangement with flex lead from A terminal. The wires from switch to coils are well separated by being alternately straight and bent, as shown.

This method cuts out the use of the set for ultra short waves, but in my case this does not matter.

Yours faithfully,

Liverpool. A. R. B.

## CORRESPONDENCE.

# SWITCHING FOR THE "MAGIC."

**AN AERIAL SWITCH—THE BROOKMAN'S REJECTOR—THE "P.W." MURAL CONE.**

**Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.**

### AN AERIAL SWITCH.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am mentioning a small item, which will be of interest to listeners who have trouble with Brookmans Park, as follows:

Use a lightning switch just outside window with a lead from a high aerial to top of switch, and also a lead from a short and low aerial to bottom of the switch, with the lead to your set in the middle of switch. By pulling switch down you will receive Brookmans Twins really selective; and, pushing up, you will be able to get long-wave stations.

W. SKINNER.

Kent.

ED. NOTE.—The lightning switch is apparently made to do a new job and another becomes necessary for protecting the outfit against lightning. We would suggest a better idea would be to leave the existing outside aerial arrangements as they stand and switch on an indoor aerial as an alternative.

### THE "BROOKMANS" REJECTOR.

The Editor, POPULAR WIRELESS.

Sir,—Having made up the original "Brookmans Rejector" months ago, I think it time to let you know my opinion of this gadget.

My set is an Osram Music Magnet, and is quite selective and sensitive alone, but with the B.R. in circuit it becomes a set that probably thousands of people dream about. Nineteen stations on medium wave-band alone during transmissions from National, Regional, and Midland, and this includes Langenberg, Rome, Milan, Oslo, Prague, Frankfurt, Toulouse, Turin, and Cologne, which I can receive any time with a little care adjusting the B.R.

I should also like to add my opinion that, believing the evidence of my own ears, this rejector can also considerably increase the strength of signals from distant foreigners.

Thanking you for the added pleasure for listening you have given me.

Yours truly,

London, N.W.3. A. W. HOLMES.

### STILL MORE "MAGIC."

The Editor, POPULAR WIRELESS.

Sir,—Many thinks for the calibration chart in "P.W." I have just identified fifteen stations with it on my "Magic" Three, and it is what I have been wanting since building the set just before Christmas. I don't think there is any need for me to add to its praises, except to say that I consider it to be all you claim. I have built a number of sets since taking up wireless, but have had nothing before to touch it for performance. Thanking you and the department concerned for my "posh" set, and wishing "P.W." every success.

Yours faithfully,

S.W.6. W. SMITH.

### THE "P.W." MURAL CONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Your "P. W." Mural Cone is the best yet. At the moment of writing there is an organ recital from London, and "Oh, boy!" it's great!

You say in your "P.W." (Mar. 1st) that it gives a "life-like reproduction." I agree; yes, most heartily I agree!—it's as good as any moving coil I have heard.

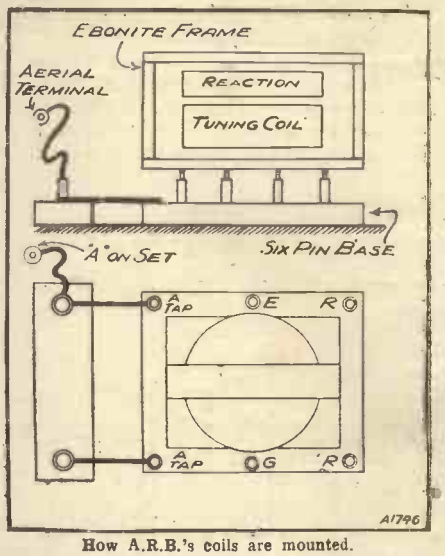
I am using a Blue Spot, but being unable to get the paper (120 to the ream), I used a penny paper-carrier made by Oxo, Ltd. It just cuts it O.K.

My wife is delighted with it, and even my son (nine years) has remarked on its clearness. In fact, I had to explain the "whys and the wherefores" to him.

If you can find room in "P.W." for this, put it in and let others share my joy, at so small a cost.

Yours faithfully,

S. Staffs. W. A. FAULKNER.




How A.R.B.'s coils are mounted.

# SHORT-WAVE NOTES.

**By W. L. S.**

I AM glad to notice that the R.S.G.B. is trying to stimulate a little more interest in the 150-metre wave-length for amateur use. A series of tests on this wave was going on throughout April, and quite a fair number of British amateurs are now working up there at week-ends. Certainly this is to the good, as the interference on the 20-metre and 40-metre bands on Saturdays and Sundays is terrible.

Whatever the good points of long-distance C.W. work may be, there can be little doubt that telephony offers to the amateur a greater variety of problems to which to put his skill, and the 150-metre wave-length is the most suitable of all the amateur bands for telephony tests, on account of the comparatively strong signals that can be transmitted over 10 or 20 miles with a power of 10 watts or less.

**Much More Reliable.**

Another piece of good news is that the 80-metre band is once more being granted to amateurs for work at the week-ends only on the new Transoceanic permits. The American stations use this band more than any other for traffic handling, and though it is naturally not so good for super-DX work, it is more reliable than either "20" or "40" for 2,000-mile regular schedules.

I have a crop of letters from readers who have frequently listened to lengthy programmes from 3 R O, Rome, confirming the identity of this station. The wave-length is somewhere in the 25·3 metre broadcast band, and I believe the power is 3 kw. The engineer is an Englishman, and all the tests are carried out in English.

A Bucks reader is now picking up V K 2 M E every afternoon at "much better strength than Zeesen." He is audible "all over the house on two loud-speakers"! This is all on the "Magic" Three, and appears to be good going!

Regarding the re-broadcast of the National Programme in the region of 31 metres, I have now had it confirmed that this is done by 7 L O at Nairobi. I gather that this will be rather joyful news to one or two readers who have been imagining that it was a harmonic of their local station that they were hearing.

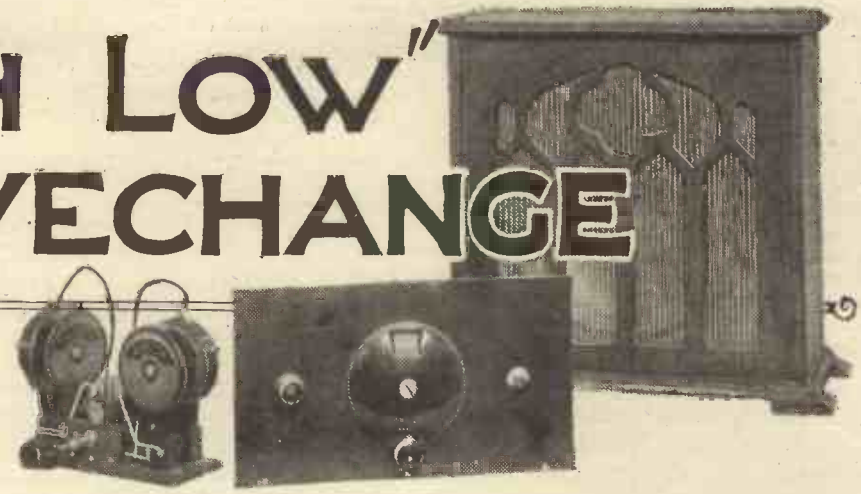
At last I have finished an "all-screened" short-wave receiver with a respectable lay-out, more or less carefully designed, and I find that the metal box does definitely reduce troubles from outside sources of "mush."

**Effect Of Earth.**

My earth, however, does not improve things at all, and although the whole thing is completely free from hand-capacity effects without an earth, if I connect the latter I cannot go near the box without shifting the frequency. This is with a loosely-coupled aerial and a straight detector and note-mag.

If I precede it with an H.F. screened-grid stage outside the box I get complete and utter freedom from hand-capacity effects whether I use the box or not. So that it appears that the aerial system is really to blame, and that the use of a screened-grid valve as an "aerial de-coupler" has very much in its favour.

# The "HIGH LOW" WAVECHANGE

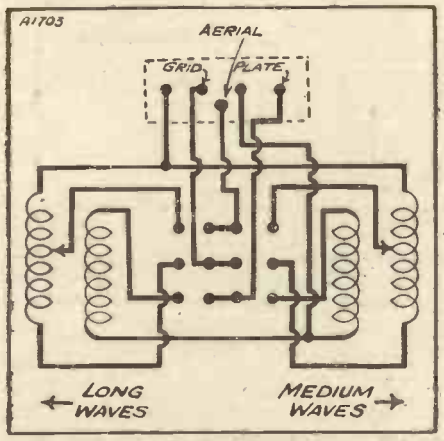


**Here is the description of a simple wave-change unit that can be used in a large number of sets, including those of the famous "Magic" series, for providing easy and efficient wavechanging.**

**By J. R. WHEATLEY.**

ALTHOUGH perhaps in the eyes of several home constructors a wave-change set is "a lazy man's receiver," there are certainly dozens of cases where a wave-change set is a real boon. In many instances the loud speaker is mounted on the top of the set, and each time this is moved there arises a grave danger of damaging both the loud speaker and the set by upsetting them.

## HOW THE FOUR COILS ARE CONNECTED.




Here we see how the long- and short-wave aerial and reaction coils are connected to the switch, enabling wave-changing to be carried out in an instant.

Again, an inexperienced person, although fully conversant with the controls, is not always capable of changing over the coils. The "high-low" wave-change unit is applicable to any type of set employing two plug-in coils. It is not intended to replace the existing coil holders, for these need not necessarily be removed from the receiver, but to convert any set of the above type into a wave-change set covering any two bands of wave-lengths.

### How it Works.

An examination of the theoretical circuit of the switch scheme clearly indicates its exact functioning.

Since there are no connections between the reaction and aerial coils this switch is adaptable to any type of circuit, whether or not there is a connection between the two coils in the set.

The three poles of the switch control, the aerial connection to the tappings on either of the two "X" coils, join one or other of the tuning coils across the tuning condenser and control the reaction coil, so that by the movement of the switch to the left or the right, the two wave-bands are covered.

This switch unit is especially applicable to sets in the "Magic" series, such as the "Magic" Two, "Magic" Three, and "Magic" One. It may appear at first sight that it would be difficult to add the unit to the above sets, but there is no reason why it should not be mounted outside the sets and leads taken through the cabinet from the coil holders to the appropriate points on the coil bases. If baseboard space is limited and the panel is sufficiently deep it is suggested that the unit might be mounted on its end.

The following details of the switch will clear up several points which are not readily understood from the illustrations. The foundation of the unit consists of a baseboard about 7½ in. × 2½ in., the exact size being dependent on the make of switch and size of coil holders.

### No Trouble.

No trouble should be experienced due to bringing the two sets of coils closer together, for even using the smallest possible switch in the position shown, the coils should still be at a distance apart sufficient to prevent interaction.

The switch is of the three-pole change-over type and should be chosen from the various makes suitable for use in high-frequency circuits. A suitable mounting is a piece of ebonite 2½ in. × 1¾ in., but here, again, the exact dimensions will have to be chosen to suit the make of switch employed.

Regarding the choice of switch, the rotary type is suggested, since it is extremely easy to add an extension lever and thus arrange the switch at the most convenient distance from the panel.

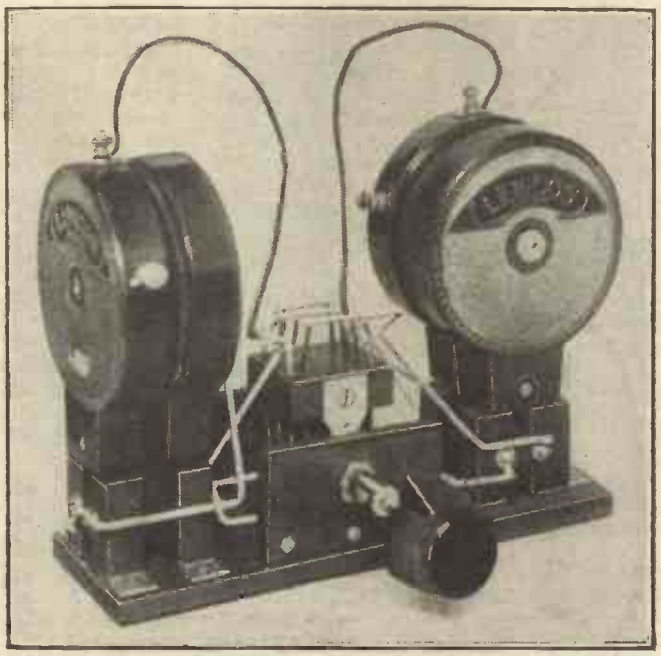
### Must Be Firm.

To increase the stability of the bracket to which the switch is mounted an additional piece of wood, which is clearly seen in the photographs, is screwed to the front of the baseboard. The ebonite strip carrying the five connecting terminals is attached to the back edge of the baseboard. Quite small terminals can be employed as they are perfectly effective, and prevent the unit from being unsightly.

The addition of the high-low unit to a set will enable the operation to be still

(*Continued on next page.*)

## MORE MAGIC FOR "MAGIC" USERS.



Owners, and prospective owners, of "Magic" receivers will welcome this easily-built wave-changing unit. By a twist of the wrist you can go over from long to short waves, and vice-versa, the aerial and reaction coils being changed simultaneously.

## THE "HIGH-LOW" WAVECHANGE.

(*Continued from previous page.*)

further simplified, since, by using a four-pole change-over switch, the additional set of contacts may be employed as an L.T. on-off switch. The switch employed in the original set has a zero position, which would enable the above to be achieved quite easily. It is also possible to gang together two "high-low" units to change not only the aerial coils and reaction, but also a tuned anode coil or a second grid coil simultaneously with the above.

**The Switch Connections.**

The actual connections to be made to the switch are quite simple. First remove the existing aerial and reaction coils from the set. Next arrange the unit in the most suitable position, either inside the set or else externally to the receiver.

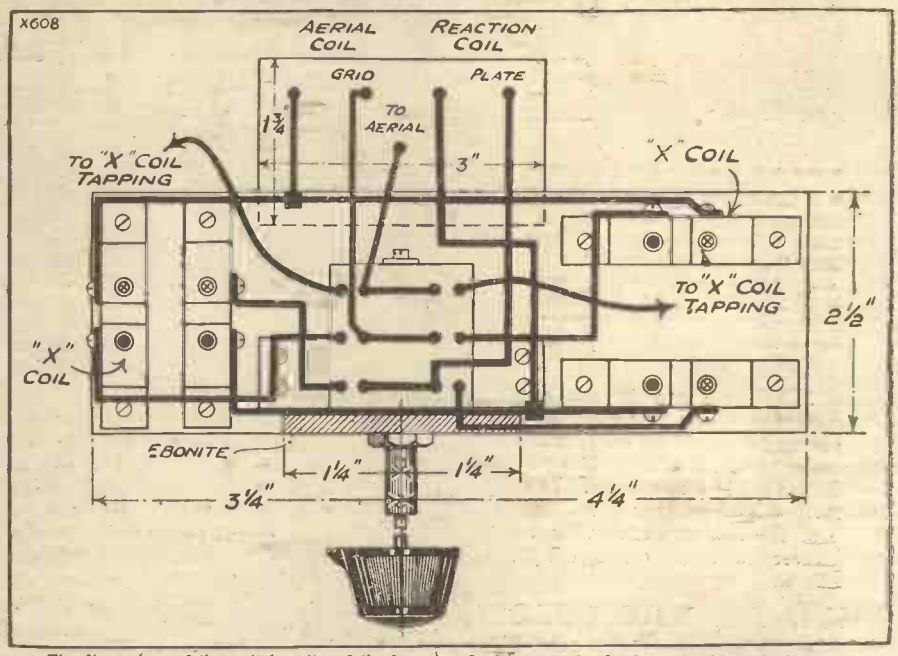
Assuming that you have a "Magic" One, Two, or Three in use, connect the aerial lead from the aerial terminal to the terminal marked aerial on the terminal strip of the wave-change unit. The long-wave coils must now be mounted in the left-hand pair of coil holders, and the medium-wave coils on the right.

The position for the aerial coils is indicated by the wiring diagram and photographs, and the two outside back contacts must be connected to their appropriate tappings on the "X" coils by means of flexible leads.

Leads are now taken from the aerial coil base in the set to the two terminals marked aerial coil in the wiring diagram. Care must be taken that the grid side of the aerial coil is connected to the terminal marked grid on the High-Low unit.

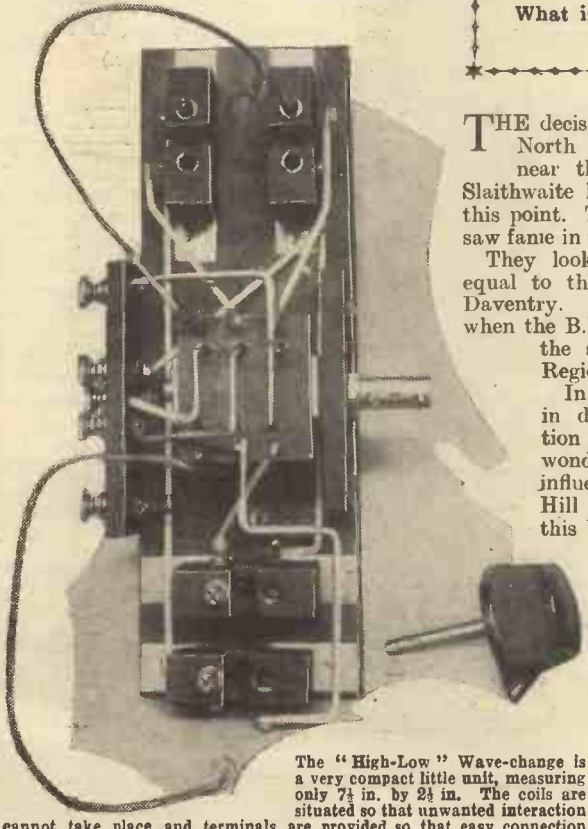
The remaining pair of terminals should be joined to the reaction coil holder in the set. In this case the plate side of the coil holder must be connected to the terminal marked plate. The handling of the receiver remains unaltered except for the wave-change control.

## A PLAN DIAGRAM OF THE UNIT.




The dimensions of the switch unit and the layout and wiring are clearly shown in this scale diagram.

## COMPLETE AND COMPACT.



The "High-Low" Wave-change is a very compact little unit, measuring only 7½ in. by 2½ in. The coils are situated so that unwanted interaction cannot take place, and terminals are provided so that easy connection either inside or outside the receiver can be made.

# IS IT "SLEWIT"?

**What is the proper pronunciation of the name of the Yorkshire town near which the B.B.C. is building the North Regional Station?**

THE decision of the B.B.C. to erect its North Regional high-power station near the small Yorkshire town of Slaithwaite has stirred up controversy on this point. The worthy folk of Slaithwaite saw fame in the B.B.C.'s decision.

They looked for publicity on a scale equal to that obtained by the town of Daventry. So they were badly put out when the B.B.C. decreed that the name of the station shall be "The North Regional," and not "Slaithwaite."

In spite of the B.B.C.'s boldness in deciding the correct pronunciation of countless other words, one wonders whether this decree was influenced by indecision at Savoy Hill about the pronunciation of this Yorkshire place name.

**A Typical Case.**

Certain it is that many a man has put his foot in it lately if he happened to talk about Slaithwaite in Yorkshire. "Slaythwaite?" "Slew-it"? "Slough-it"? Or "Slow-it"?

A story is told of a Slaithwaite man talking about the controversy to a visitor as they travelled by train from Leeds to the town. At the station before Slaithwaite the local man said to his friend, "I will ask the porter here what is the name of the next station and we shall hear how he pronounces it."

When the train stopped the local man put his head out of the window and did as he had said. To the delight of his friend, the porter, who had recognised him, replied, "Who is tha coddin'? Tha knaws very well what t' next station is."

**"Moorside Edge."**

Further to disappoint the hopes of Slaithwaite, the name of the actual site of the new station, "Moorside Edge," has caught on as a colloquial name for the station, just as "Brookmans Park" is used for the new London station.

* * *

(Well, what is the proper pronunciation, anyway?—ED.)

I don't know. That's what I'm asking.

(Anyhow, you've given Slaithwaite some of the publicity denied to it by the B.B.C.—ED.)

*READ*
**MODERN WIRELESS**
*Britain's Best Radio Magazine*

EVERYTHING The G.E.C. your guarantee ELECTRICAL

# A MONTH OF 39 DAYS!

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# RONALD FRANKAU *talks on* RUNNING A RADIO REVUE

**In this special interview with S. Howard Jones, one of our most popular broadcast entertainers discusses the problems that confront a radio revue producer, and tells you how he prepares his merry microphone shows.**

RUNNING a radio revue is not the easy affair that the average wireless listener imagines. At least, that is what Ronald Frankau says, and since he has run more wireless revues than any man in the country, he ought to know.

Every time he takes his talented little company before the microphone means many hours of thought, concentration, and writing, to poor Ronald—real hard work that must be sandwiched in between his ordinary stage and concert appearances.

Mr. Frankau must surely be the busiest man in the theatrical business to-day. My efforts to find him drove me well-nigh desperate. One week he was at Manchester, the next at Southsea.

### Found at Last.

A few days later he popped up at Malvern! But I stuck grimly to my task, and finally ran him to earth in his dressing-room at the Palladium, at a Sunday evening concert.

"How do I run a radio revue?" he asked, motioning me to an armchair, and pushing across a box of cigarettes. "Well, if I were to tell you only half the troubles one is up against, you could fill a book Have you ever given it a thought?"

"Of course," I replied. "It sounds a jolly business."

"Jolly? Believe me, there's nothing very jolly about it, although, I suppose, to the man in the street it appears simple enough. Just collect a few songs with catchy tunes, a sketch or two, add a few jokes with appropriate comic patter, and mix them up.

"Hand out your typescript to the various artistes who are going to perform, place them before a microphone and—hey presto! everything is complete. Well, if it was as easy as that, I should be a happier and less harassed man. Radio revues cannot be turned out like plum puddings.

"Just think of the difficulties which confront the producer of the radio revue. In the first place, you have to realise that, no matter how clever or convincing your show may be, it is doomed to a life of one or two performances.

### The Care that is Needed.

"Human nature being what it is, there is a tendency on this account to spend a little less time, and to be a little less thorough in the supervision of the production. In short, there is a temptation to collect scrappy material in a scrappy manner for the radio revue.

"To yield to such a temptation—and at times it is not easy to resist—would be fatal. A revue for wireless listeners must be supervised with all the care of a West-End production, or as near that ideal as possible.

"No trouble must be spared to polish off all those little details which so often mean the difference between success and failure. The lines and sketches all have to be carefully rehearsed—a word taken out here, another added there, until the desired effect is reached.

"After all, the wireless audience, the largest in the world, deserves as much consideration as the patrons of the theatre. Besides," added Mr. Frankau, with just the suspicion of a smile on the corners of his lips, "the B.B.C. would probably have something to say to the producer who turned out a second-rate revue for them!"

"Is there much difference between wireless technique and stage technique?" I asked.

"Of course there is! I know this has been said many times before, but it is a fact which I must always keep before me. The song or sketch which succeeds on the stage may easily prove a miserable failure before the microphone.

Mr. Ronald Frankau himself writes a vast amount of the material which he and his companions broadcast.

"Some comedians find it quite impossible to be funny in the studio. The reason is not difficult to understand. On the platform one can raise laughs through two entirely different media—comic make-up and gestures, and by speech.

### The Voice Only Counts.

"The wireless humorist, however, can call no red noses or comic whiskers to his aid. He has no battered hats, torn clothes, or outsize boots to help him with his work. He is a voice artiste, pure and simple. The strongest gun he carries is voice control—inflexion, intonation, modulation, and so on."

"Does the studio audience help you?"

"Undoubtedly. It acts as a sort of human laughter gauge whereby one may judge the success of the jokes and gags that are 'put over.' But one should never lose sight of the fact that the duty of every broadcasting artiste is to entertain the invisible multitude, not those who have been fortunate enough to gain entry to the studio."

Mr. Frankau declares that he has spent many sleepless nights over his radio revues. His material has to be both funny and original, and sometimes his fount of inspiration runs dry.

At such times, he simply sits down with a blank sheet of paper before him, and thinks and thinks until the right idea comes along. He is very much against the re-hashing of old jokes for wireless programmes.

### Before the Microphone.

Nor is it only the collecting and arranging of his material which bothers him. It is the actual broadcasting itself. He and his company make a point of learning their lines by heart. As he says, this means a lot of extra work, but ensures that the words, when received, do not sound artificial.

Perhaps his greatest trouble is "nerves," that bugbear of most good performers. To him broadcasting is a nightmare, and the studio a torture chamber. When he stands before the microphone, his songs sound like the screechings of a soul in torment, to his own ears, and his jokes, which seemed so good beforehand, become flat and pointless.

"It is indeed fortunate for me that I do not have to judge my own performances," he concluded. "I should give myself the sack immediately."

# RADIO-ROMA

**A description of one of the most powerful broadcasting stations in the world. It regularly transmits on 441 metres, with a power of 50 kw., and can clearly be heard in this country on simple sets.**

**From A SPECIAL CORRESPONDENT.**

ITALY became a leading factor in European broadcasting at the beginning of the year, when one of the most powerful stations in the world was inaugurated. The transmitting plant of the radio station is located in Santa Polomba, a little suburb outside Rome, and connected by direct wire to the studios in the heart of the Italian capital.

The control gear. Here sits the engineer who switches-in the various studio microphones and who adjusts the modulation to suit various items.

The new super-radio station was designed by, and installed under the supervision of, American engineers as part of a contract under which the R.C.A. Victor Company sold the entire operating equipment to the Ente Italiano Audizioni Radiofoniche, the Italian broadcasting company.

Programmes of entertainment and news bulletins are broadcast, and it is expected that soon the voice of Mussolini will be heard frequently from this station.

### The "Last Word."

The new Radio-Roma station represents the last word in broadcast transmitter development, and embodies several outstanding advances in American radio technique. While the new station is rated at 50 kilowatts in the antenna, by means of a special modulation scheme it is capable of reaching a peak of 200 kilowatts output during transmission.

In addition, new high-voltage mercury vapour rectifying tubes increase the operating efficiency, and effect a saving in energy of from 35 to 40 kilowatts over the ordinary type of valve rectifier. The Rome station uses 100 kw. transmitting "Radiotrons," which are the largest vacuum tubes in commercial use.

### Perfectly Steady Wave.

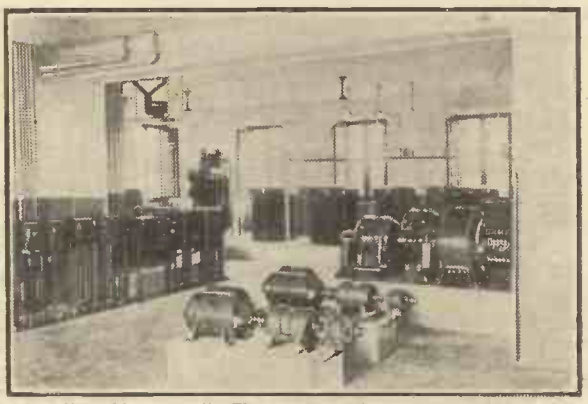
Another feature is the system of constant frequency regulation which keeps transmission steady on the desired wave-length. This is carried out with crystals which are kept in a special temperature-controlled oven. The temperature in this oven never varies more than one-tenth of a degree.

Here is the main transmitting apparatus. The engineer-in-charge occupies the desk and closely watches all the meters on the various panels.

The equipment for the new station was shipped last August and construction was begun immediately. The La Scala Opera House, Milan, has been wired with microphones, and it was planned to make broadcasts from this theatre a regular feature.

All Italy is most enthusiastic over the quality and power of "Radio-Roma." The 100-kw. valves have proved fully able to stand the enormous power during the modulation peaks, and listeners more than 1,000 miles from Rome report clear, powerful, and constant reception.

I expect that many of my readers will be familiar with this station, one of the most outstanding between the London Regional and Midland Regional transmitters. Rome can be heard every night on quite simple sets, as he is placed well away in wave-length from our Regional stations.



The "machine room." The generators in the foreground supply current for the valve filaments. Right at the back are the power transformers.

The aerial lead-in goes straight to the aerial tuner. You can see a portion of the huge tuning condenser on the left.

## FROM THE TECHNICAL EDITOR'S NOTE BOOK

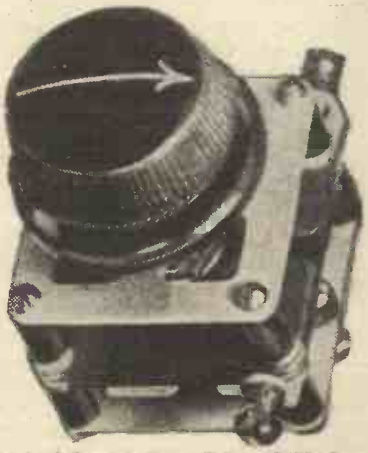
# Tested and Found—?

### MAGNUM DIFFERENTIAL CONDENSER.

THE special reaction systems now used, particularly in "Magic" sets, demand the employment of a new component—the differential condenser. The differential condenser itself is not as new as the "P.W." "Magic" sets, although "P.W." readers will know that it is in the "Magic" we find differential reaction applied properly for the first time.

When I say "properly," I must hasten to add that I use the word in the sense of "to the fullest advantage."

Messrs. Burne-Jones & Co., Ltd., now have a differential reaction condenser suitable for these very modern circuits. A



An insulating spindle is a feature of this Burne-Jones component.

special feature is that it employs a spindle fashioned of an insulating material, thus rendering unnecessary the use of insulating bushes.

A pigtail connection to the moving vanes is to be found in this reaction condenser, while the widely spaced terminals have slotted nuts, a very attractive innovation to be found in many modern components, for which I believe we have to thank Burne-Jones & Co., Ltd., themselves. Altogether it is an excellent component, and quite good value for money at 6s., in ·0001, ·0002, ·0003-mfd. capacities.

### VERT WIRING CLIP.

The Vert Wiring Clip is a sort of double, square washer and it makes wiring a quick, simple business. You slip on the clip, poke in the end of the lead, and screw down the terminal nut. Connection to the centre of a lead is easily made, while two or more leads can be accommodated on the one terminal quite comfortably, all making good contact. The Vert Wiring Clip is a product of W. Green & Son, of Horley, Surrey, and if it is made freely available at attractive prices, it should prove popular among radio-set constructors.

### "TUNE-WELL" COILS.

Turner & Company have forwarded us a letter addressed to them from an amateur who says he has used the "Tune-Well" D.X. Coils with successful results in the "Magic" Three.

### THE REGENTSTAT.

This is a variable power resistance manufactured by those excellent mains unit people, The Regent Radio Supply Co. Its retail price is 7s. 9d. It covers the range of from 250 to 4,000,000 ohms (250 ohms to 4 megohms) with a maximum constant dissipation of ten watts.

Thus it will pass 50 milliamps at 200 volts, 100 milliamps at 100 volts, etc. It is a very well-made component, and I like its solid metal structure. It is, of course, particularly useful for mains units, although there are many other jobs it can do in a radio outfit. On test I have found it efficient and in every way quite satisfactory.

### NEW REGENTONE MAINS UNIT.

Regent Radio Supplies Company are now in production with a new Regentone mains unit which provides both an H.T. supply and an L.T. charging current for any popular two- three- or four-valve outfit.

### THE MARCONI LICENCE.

"The Wireless and Gramophone Trader" has published a book at 6d. entitled "The Marconi Licence." It is an analysis of the patent position, written by a leading patent authority, and is intended as a guide to radio manufacturers and those whose business includes the resale of manufactured radio instruments. It is an authoritative booklet that should be in the hands of all radio traders.

### A DOUBLE-CONE CHASSIS.

The Shaftesbury Radio Co., of 184–188, Shaftesbury Avenue, W.C.2, recently sent me one of their Wates Universal double-cone speaker chassis. This is a somewhat smaller version of the now well-known Wates Star double-cone chassis, but, unlike this, which was designed specially for use with a Wates Star Unit, the Universal chassis will accommodate any cone unit.

A special bracket, complete with the necessary bolts and nuts and an extension spindle is provided for this purpose. The cost of the component is 11s. 6d.

There are two cones of different sizes, the one 11½ in. diameter, and the other 5 in. diameter, fixed together at their centres, and mounted back-to-back.

These cones are made of special paper, treated with an oil which prevents deterioration through dampness or other atmospheric conditions. The purpose of the two cones is, of course, to give equal treatment to both the high and low notes, the larger cone responding more easily to the lower tones, and the smaller to the higher notes. Both are free-edged.

I tried this Wates double-cone chassis in conjunction with several of the leading makes of speaker units, and I must say I consider the results particularly good. It is interesting to note that the chassis has been designed to fit the majority of existing cabinets.

**WHEN YOU ARE BUYING—**

**(12) A RADIO CABINET.**

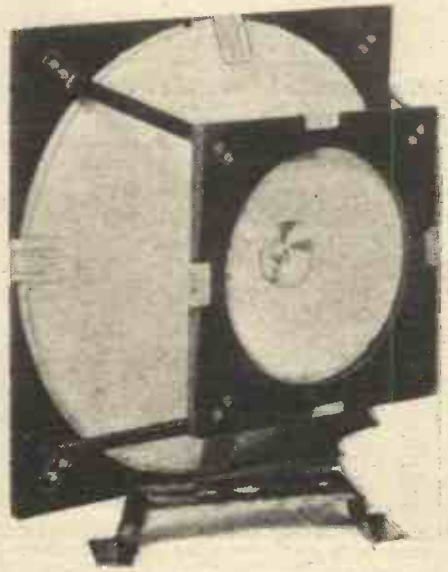
**Make sure that it is built of good, well-seasoned timber. Warping is a serious thing in a radio cabinet, it sometimes makes it almost impossible to get the panel and baseboard out. Generally speaking, you will find that oak will warp more readily than mahogany or walnut. It is well worth paying the extra money for these last woods.**

**Many of the cheaper cabinets are classified as "Walnut Finish," "Mahogany Finish," etc., but these may mean that they are built of cheaper woods stained the appropriate colours.**

**French polishing is an expensive but worth-while finish. It is hard and durable, and retains its gloss. Ordinary varnishing often scratches very easily indeed.**

### NEW COSSOR DEPOT.

The Cossor people have opened a Liverpool branch house. The address is 42, Paradise Street, Liverpool (Telephone: Central 1811). This depot will allow them to secure an adequate distribution of their products throughout South-West Lancashire, South-West Cheshire, and North Wales.



The Wates Universal double-cone speaker chassis.

# CAPT. ECKERSLEY'S QUERY CORNER

COIL AND CHOKE—A CURIOUS FAULT—CONDENSERS AND CURRENT FLOW.

**Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.**

**Coil and Choke.**

A. C. (Merton).—"Why can one use an identical coil both as an H.F. inductance and an H.F. choke?"

Because a choke is only another name for an inductance! We usually, however, use the term high-frequency inductance to denote an inductance acting in a high-frequency circuit with a condenser to exhibit resonant effects, as at (2) in the diagram.

The circuit then has a much greater impedance at a certain frequency than at any other—we call that frequency the frequency of resonance. But we use an inductance as a choke if we want to keep some point at high frequency potential and not let that point be short-circuited to earth.

Thus in the circuit shown at (1) the anode of the valve has to be kept at H.F. potential, we mustn't let it be short-circuited to earth through the H.T., and so we connect a choke (which is truly only an inductance) as shown, and this choke acts as a high impedance to a lot of frequencies, not as when it was paralleled to a condenser mostly at one frequency.

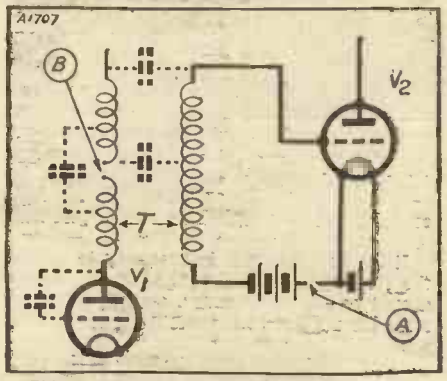
As a matter of fact, chokes have self-capacity and do resonate at certain frequencies, but these need not sway us in a general deduction.

**A Curious Fault.**

B. M. A. (Harrow).—"My receiver, which is of the det. and 2 L.F. type, recently ceased to function altogether. It was noticed, however, that distorted reception could be obtained by removing the plug from the grid battery positive. Subsequent investigation revealed that the primary of the second L.F. transformer was broken, that being the cause of the trouble.

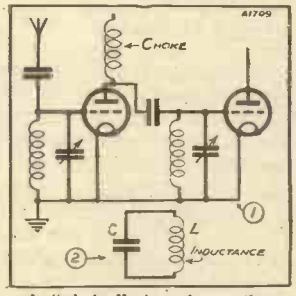
"Could you explain why some sort of reception could be achieved with this faulty transformer by merely disconnecting the G.B. positive from the L.T. negative?"

## A CURIOUS FAULT.




This sketch shows how B.M.A. got his signals through, as described above.

## COIL OR CHOKE.




A "choke" is only another name for an inductance.

Look at my diagram. Alternating currents normally flow up and down the primary of the transformer T. But this gets broken at B. But the *voltage* at B may continue to rise and fall because the valve $V_1$ continues to change its impedance. This can only happen provided the break B is not so severe as to limit all voltage getting on to the anode of $V_1$.

That is to say, provided the break B is not absolutely clean, but constitutes a very high series resistance. If, then, the primary varies in potential, capacity effect makes the secondary vary in potential, this is terribly feeble and it gets shunted straight to earth via the grid battery.

Disconnect the grid battery when both primary and secondary vary in potential above earth and this communicates a varying potential to $V_2$. If the grid never goes positive this can go on without paralysis.

Heaven knows if I am right, but it's the sort of spurious effect one does get in queer circumstances. If B is a clean break and $V_1$ gets no voltage one might assume that grid anode capacity of $V_1$ is sufficient to raise the valve transformer up and down in potential provided A is broken.

**Condensers and Current Flow.**

J. R. W. (Felixstowe).—"Why can a condenser pass an audio frequency current—which I have always understood is a one-way current—not alternating nor oscillating though varying?

"I allude to its use in passing rectified current back, for reaction as in "Reinartz" circuits, and to its use in passing on low frequencies to the loud speaker where a choke filter output is used."

But who told you that an audio-frequency current was a one-way current, and what did they mean by "one-way"? The only current a condenser will not pass is a steady current.

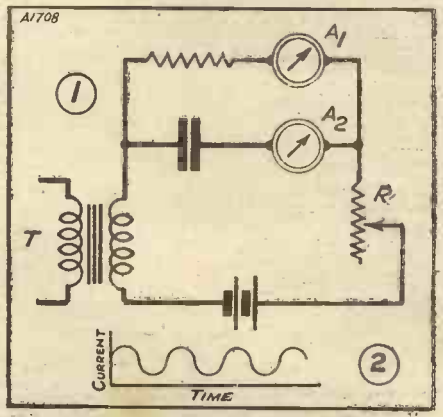
If we had a battery and a resistance and ammeters as shown, and closed the switch, we should read no current in the condenser branch (except a flick on switching on), when a steady current—a "one-way" current flowed—though R A1 would read, A2 would not. Now suppose we waggled R up and down quickly—A1 would read a waggling current and A2 (a hot wire ammeter for choice) could also read a current. The current, if you like, is a "one-way" current, but it's not a uniform, steady current, and it apparently "finds its way through" a condenser.

The current is not a steady current, but a varying current, as shown at (2), and it charges-up and discharges from a condenser, and there is a waggling up and down about in the condenser branch.

Now R could be a microphone and make the unidirectional current vary in intensity. If we had a transformer at T, the secondary would give alternating current and no D.C. current.

So the audio-frequency currents produced as variations on top of a one-way current could "go through" a condenser, and furthermore, the transformer could remove their waggly part and we could get fine A.C. output and, of course, this "goes through" any condenser, too.

## D.C. OR A.C.?




The effects of a condenser on current flow is illustrated here.

# MABEL CONSTANDUROS.

**A chat with one of the most popular of British Broadcasting Stars.**

**By A SPECIAL CORRESPONDENT.**

EVERY listener knows Mabel Constanduros. "Mrs. Buggins," in fact, might be said to have become incorporated in broadcasting history. The other day, when I met her for the first time, I asked her if she thought broadcasting had enhanced her reputation as a variety artist.

"Oh," she said, "it has not only enhanced my reputation, but *made* one for me!"

Five years ago Miss Constanduros was only an amateur; and she had never been on the stage in her life until just lately.

Mabel Constanduros—who is famous for her sketches of the Buggins family.

This sounds hardly believable when you hear her broadcast in some of her inimitable sketches.

"I have always wanted to do something real," Miss Constanduros told me; "and, of course, I had acted in my own sketches at amateur shows and charity performances and my friends were always kind enough to think me 'quite good.' So one day I plucked up courage and walked into the offices of the B.B.C. and asked for an audition.

"I had no friends to 'push' or 'boost' me, no letters of introduction; in fact, I was nobody as far as the B.B.C. officials were concerned.

"But they gave me an audition—and what a terrifying experience it was! To begin with, I was left alone in one of the studios with the microphone. I'd never seen one before. It looked at me and I looked at it. I got the idea it was a rather sneering sort of microphone. And then the studio official said, 'Now do something,' and just calmly walked out and left me!

### "My First Broadcast."

"To say anything, let alone be funny, in front of that microphone, was frightening enough, but I realised that I must say something—now was my chance. So I wildly dashed into one of my sketches. Suddenly a voice from apparently nowhere said, 'Now do something else!' So I did—what, I don't know; but, anyway, the result was I got my first real professional engagement.

"Then came the evening of my first broadcast. I shall never forget it. There was a very important lady who was going to speak just before me. For obvious reasons I will not mention her name. I was simply petrified—so, it seems, was the very important lady—but she was so busy being consoled by all the young announcers who were, in turn, giving her last-minute advice and holding and patting her hand, that nobody took the slightest notice of poor me. I also had a hand that needed quite a lot of holding—but not patting!"

When I asked Miss Constanduros what she considered were the most important qualifications of a successful broadcasting artiste, she replied:

"Absolute sincerity—and a microphone sense. This, for some reason, does not seem to be a thing that you acquire like an accent or a brogue. Either you have it or you have not; it seems I am lucky enough to possess it.

"If you are not sincere in your work it 'gets across' immediately, and your unseen audience sense it. In fact, the slightest boredom in the voice of a broadcaster seems to register itself instantly to the listener.

### Mabel Prefers the Studio.

"It is very different playing to a visible audience and an unseen one, and because I did broadcasting before I went on to the music-halls, I much prefer it if there is no one in the studio at all. Frequently an audience is specially invited, as some artistes like to hear how their performance is going; and, also, it acts as a stimulant. But I always feel that the nearer my 'speaking thoughts' are to the microphone—which is, in fact, my listening public—the better."

Miss Constanduros writes all her own work. She told me she has no difficulties in finding material for her wireless sketches: a chance remark of a passing woman, or perhaps a porter on a railway station, gives her masses of ideas on which to work. But, then, Miss Constanduros has a fertile brain, for she not only writes broadcast sketches, but songs and poems for children.

It would be impossible to meet a more delightfully modest person than Miss Constanduros. She told me, quite simply, that she feels a tremendous thrill when she sees her name billed in large letters with other important artistes, and wonders if it can "really be true." Her dream has come true, anyway!

One gem of Miss Constanduros's characterisations so well known to the listening public is "Grandma." She tried to think of the most tiresome old lady imaginable, and wrote up the part for the edification of her mother.

She gets a lot of fun out of writing sketches; and, although she uses several accents at the same time, each character is so firmly imprinted on her mind that she never forgets them.

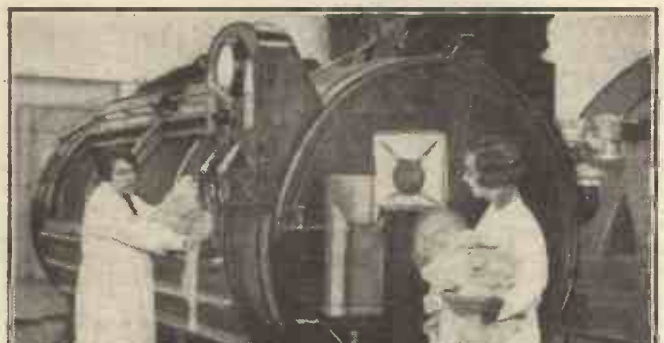
### "Exaggerated" Voices.

Miss Constanduros thinks that women's voices can be so overtrained for broadcasting that they sound exaggerated and alike.

"To keep your own personality is vitally important," she remarked. Be natural. That, to my mind, is one of the great essentials in broadcasting."

Which listeners, who know how often some radio artistes "force themselves," will agree is advice well worth having printed on placards in the studios at Savoy Hill.

## MACHINERY CONTROLLED BY THE VOICE.



One of the features of a recent laundry exhibition was a huge washing machine which was started and stopped by speaking into a microphone. The microphone was, of course, connected to a special amplifier.

## POINTS TO REMEMBER.

**Threaded brass rod should not be held directly in the metal jaws of a vice, but should be placed between two pieces of soft wood which can with safety be gripped by the vice.**

* * *

**As it is difficult to make perfectly clean cuts through brass rod without spoiling the thread, a useful method is to affix one or two nuts to the rod before cutting it, so that when these are unscrewed the thread displacement is restored.**

* * *

**If your cone loud speaker is enclosed in a box and reception is a trifle "boomy," try the effect of removing the back of the case, when, if results are improved, an open-work back is indicated.**

* * *

**If one of your telephone earpieces breaks down remember that a wire across its two terminals will probably "restore" the 'phones temporarily, and enable you to listen to the conclusion of the programme on the one earpiece.**

* * *

**Among common causes of distortion are batteries running down, use of unsuitable valves, too much reaction, insufficient H.T., L.T., or G.B., and an unsuitable value of grid leak.**

* * *

**If for any reason it is necessary to remove the diaphragm from the telephone earpiece, it should be slid off sideways, and not pulled up from the magnets, as this is liable to bend it.**

* * *

**Do not make marks on the back of the panel with a lead pencil, as the pencil mark affords a high resistance conductive path on the ebonite surface, and impairs its insulation.**

# SET STRESSES

**An interesting chat about some unusual mechanical aspects of radio set design and operation.**

**By G. V. DOWDING, Assoc.I.E.E.**

SOME people are very mechanically minded, but it is not to these folk that I am addressing this article. To prove whether or not you come in the excepted category ask yourself this question. Supposing in your set you had a spring contact arranged as in Fig. 1. If you wanted to bring the two contacts nearer together would you press down hard somewhere in the centre of the spring? If that were to be your inclination, please read on.

First of all, I must explain that the result of such an unmechanical method would be to cause a kink in the centre of the spring as at Fig. 1B and separate the contacts still further. The correct procedure would be to use flat-nosed pliers, insert them gently under the spring at about the point marked X, gently raise the whole spring up and, gripping the pliers firmly, bend the free end of the spring downwards (Fig. 1C).

### The Simple Lever.

It would be better to bend the spring downwards from the anchoring block but there would not be room to get the pliers underneath at that point. It might so happen that the only available pliers were very clumsy instruments quite unsuited to the task.

In such a case, I would push some suitably sized object under the point X (raising the spring slightly by this means) and then force the free end of the spring down.

A thorough appreciation of the functioning of the lever is remarkably useful knowledge. It is, of course, most elementary mechanics, the sort of thing that we all learn at school, but which generally gets smothered in a welter of not too useful history and other such stuff.

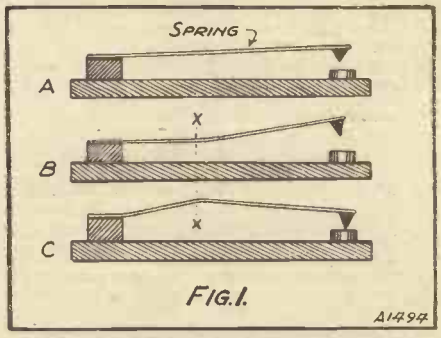



FIG. 1.

This picture illustrates the effects of correctly (C) and incorrectly (B) bending a switch spring that is not making good contact (A).

A simple lever is shown at Fig. 2A. The point F upon which this lever rests is known as the fulcrum, W is the weight to be moved, and P the power that has to be applied to move it. That portion of the lever between W and F is sometimes called the "weight arm," and the rest of it between F and P the "power arm." And the power that has to be applied to move a certain weight depends directly upon the ratio of FW to FP. Let me amplify that a little.

The ratio of the power required to the weight to be moved is the ratio of the length of the arm at the end of which the weight is fixed (the weight arm) to the length of that at which the power is applied (the power arm). That is to say, if the distance between F and P is ten times that between F and W, the power required is only a tenth of the weight but the distances through which the power and weight will respectively be moved are in the opposite ratio. The weight moves only a tenth of the distance of P.

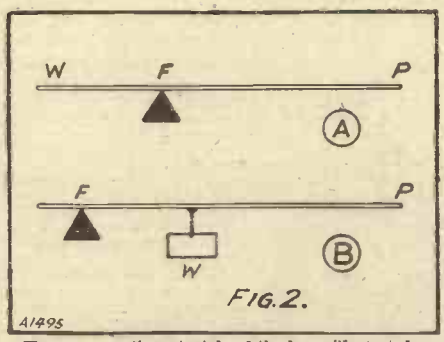



FIG. 2.

Here you see the principle of the lever illustrated.

### A Few Figures.

It is not necessary for the fulcrum to be in a central position. It can be at one end as at Fig. 2B, but this does not in any way affect the above laws. The weight arm is WF and the power arm WP, just as before.

A few figures by way of example will not do any harm. Supposing W were actually a weight of 200-lb. What arrangement of lever would be necessary if you required to lift W with a force of 10 lb.?

The ratio of PF to WF would have to be 200 to 10. This could be in inches, feet or anything suitable.

Examples of levers are to be found everywhere in everyday life, but we need not go farther than our radio set to find many practical illustrations. Your set may or may not be fitted with panel brackets. If it is not I hope you do not push it about

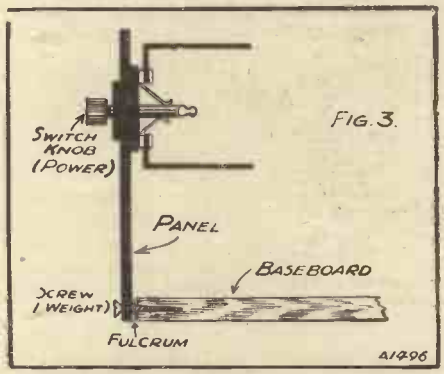



FIG. 3.

Pulling or pushing a set by a knob on its panel may impose considerable strain on the fixing.

by one of the knobs fixed towards the top of the panel. If you do, the panel-securing screws will be subjected to big strains.

It is quite easy to interpret these in simple mechanical terms. The switch knob might be that of an on-off control fixed as at Fig. 3. This will correspond with P in either Fig. 2A or Fig. 2B. The screws will act as the weight W while the fulcrum will shift from the top to the bottom of the baseboard as you push and pull. In either instance the tendency will be to exert a pulling force on the screws.

### Pushing a Panel.

Supposing the switch were fixed seven inches away from the bottom of the panel. The screws might quite conceivably be a quarter of an inch up. The ratio is 28 to 1, so that when you pull on the switch, 28 times the power you exert is applied to the extraction of the screws! 5 lb. of pulling power would represent 140 lb. screw extracting power!

When you push, the panel is forced against the top edge of the baseboard and this becomes the fulcrum. Thus your power arm will be reduced in length to the distance separating the top edge of the baseboard and the switch, which might be about 6¾ in., so that your ratio drops to 6¾ to ¼, i.e. 27 to 1. The nearer to the bottom of the panel you apply your pushing or pulling force, the less the ratio and the less the strain on the screws. The smallest strain is, of course, when you pull or push in line with the screws themselves.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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*The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

# QUESTIONS AND ANSWERS.

### DOWN BELOW LEEDS.

D. R. W. (Leeds).—"Is it a fact that the Leeds station transmits on the lowest wave-length in Europe?"

There are two stations on the ordinary wave-length band below Leeds—one in Sweden and one in France. In addition, of course, there are a number of broadcasting stations working on really short waves but on ordinary wave-lengths 175 metres is the lowest: and this is alloted to St. Quentin, France.

Above this is Karlskrona, on 196 metres, this being a Swedish relay station that takes the Stockholm programme on 25 k.w. Leeds on 200 metres, with a power of 0·13 k.w., has the third wave-length.

### CRYSTAL DETECTOR WITH L.F. AMPLIFIER.

T. H. (Nr. Reading).—"Can you tell me of a low-priced blue print describing the construction of, and parts required, for a crystal set with one low-frequency valve."

The "P.W." 6d. blue print No. 4 describes a circuit of this kind, the components required being ·0005-mfd. variable condenser, one single coil holder for panel mounting, one L.F. transformer, one valve holder, one filament resistance; one ·001 fixed condenser, one crystal detector, one panel 8 x 8 x 3/16th, one box to fit, 4½ in. deep, nine terminals, wire screws, etc.

The accessories required are an L.T. battery and H.T. battery (to the valve manufacturer's specification), one L.F. valve, one pair of 'phones, and one plug-in coil (50 to 75 turns for ordinary wave-length and 150 to 200 turns for 5 X X).

NOTE.—"P.W." Blue Prints can be obtained upon application to the "P.W." Technical Queries Dept., The Amalgamated Press, Ltd., The Fleetway House, Farringdon Street, London, E.C.4. Sixpence should be enclosed for each blue print required and, in addition, a stamped addressed envelope must be forwarded.

### A GOOD ONE-VALVE CIRCUIT.

M. F. L. (Peterboro').—"Amongst the components on hand I have a ·0005-mfd. slow-motion condenser, a two-coil holder, an H.F. choke and a ·0003-mfd. reaction condenser. Also valve holder, fixed condensers, etc., with which I should like to hook up a one-valver for 'phones' reception in the Reinartz fashion. What are the connections?"

With a two-coil holder we should use separate aerial and grid circuit coils, and, in this case, the connections will be as follows:—

Aerial to one side of the aerial coil holder, other side of aerial coil holder to earth, to one side of the grid coil holder, to ·0005 tuning condenser, one filament socket on the valve holder, to H.T.— and to L.T.—.

The other filament socket on the valve holder goes (via switch) to L.T.+, and also to one side of the grid leak. Remaining side of the grid leak goes to grid terminal on the valve holder and to a ·0003-mfd. or ·0002-mfd. fixed condenser. The remaining side of this grid condenser goes to the fixed vanes of the ·0005-mfd. variable condenser and to the remaining side of the grid coil holder.

H.T.+ goes to one of the telephone terminals, the other telephone terminal goes to the H.F. choke. The remaining side of the H.F. choke goes to the plate socket on the valve holder and to one side of a fixed condenser of about ·0005-mfd. (certainly not less than ·0003.)

The remaining side of this goes to the moving vanes of the reaction condenser, and the fixed plates of this condenser are taken to the aerial side of the aerial coil holder.

NOTE.—With this arrangement the aerial coupling coil is used also as a reaction coil, and to cover the ordinary broadcasting wavelengths you need a 25 or 35 coil for the aerial socket, and a 50 or 60 for the grid socket.

### SEPARATING TWO STATIONS.

B. L. T. (Edgware).—"At first I thought I should have to give up the wireless altogether, as both the programmes came in at once, and it was an infernal nuisance. But a centre-tapped coil helped a bit.

"Then my cousin came down and showed me that by shortening the aerial I could bring in one and lose the other, though I lost a little bit of strength in reducing from 40 to about 20 feet. If I cut the aerial down more than that I lose too much, and what I should like now is just a little extra selectivity to remove the last trace of the National when I am listening to the Regional.

"I had before tried putting in a ·0001 mfd. fixed condenser, but it was no good. Is there any other way?"

Now that you have shortened the aerial you might find that the ·0001 condenser would do the trick, and enable you to separate the two stations perfectly. Apart from this there are several things you can try:

The easiest of all is not to use the centre tap on the coil but to get a length of wire and wind about 25 turns of it round and round a bottle to form a hank of wire of the same size as your tuning coil. Tie this extra coil of wire to your tuning coil by means of cotton or string (*not* wire), and join one end of this extra coil to the earth terminal on the set or to any point connected to it, such as one side of the coil holder.

Now undo your aerial wire and fix it to one of those little crocodile clips, clipping this first of all on to the free end of the new coil of wire (this will be instead of taking the lead to the centre tapping on the coil).

If the selectivity is not improved take a penknife and carefully scrape some of the insulation away from the new coil two or three turns from the free end of the wire. Put your crocodile clip on this, to see the effect of selectivity here.

If the tuning is still not quite sharp enough, bare another place on the wire two or three turns round until you find a spot which does not reduce strength too much but gives you just the necessary separation for the two stations. When this is found cut off the unnecessary turns of wire from the new coil and your selectivity troubles will be over.

### TWO AERIALS ON ONE MAST.

L. M. (Croydon).—"My neighbour, who is a very decent chap, has asked me if I will let him fix his aerial to my mast, which is a 45-footer. Is there any objection to this?"

From the point of view of efficiency the only trouble is that you are violating the rule that aerials should be kept as far apart as possible, in order to prevent interaction between the two receivers: If you let your neighbour's aerial run close to yours the possibility is that every time he adjusts his set you will hear it very clearly, and similarly when you adjust yours he will hear that.

Not only may the strength of each set be affected when the other is switched on, but if reaction is employed on either set quality on the other set may be impaired as well. Therefore, we do not recommend the sharing of a mast as a general rule, although there are plenty of cases in which it is successfully done, especially when neither set is using reaction, and when one of the aerials is not fixed to the top of the mast like the other, but is connected several yards lower down.

### TWO-DIAL TUNING.

L. A. (Clifton, nr. Bristol).—"I had not tackled two-dial tuning before, and in my inexperience I do not seem to be getting all I should with the set. It is very powerful, but I do not know what to do with the two dials to get the proper tuning for any given station. What is the method?"

The chief thing with two dials is to keep them "in step." Unless both circuits are tuned to the same wave-length there will be a large drop in strength and most stations will be missed.

(*Continued on page* 214.)

## WHAT DO *YOU* THINK ABOUT THIS?

**A Small Heath listener, who lived in a flat and was keen on long-distance listening, changed from an indoor to an outdoor aerial in order to get greater range. The lead-in, after passing through a landing window, was taken up to a very tall chimney, and though results were greatly improved, on the whole, the set was troubled by occasional "deadness," when all stations would disappear! This had not happened with the indoor aerial previously used. Can you tell**

**WHAT WAS WRONG?**

**N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to above next week.)**

*The fault that puzzled the Falmouth listener—as described last week—was the old, old mistake of reversing the H.T. battery connections. In hurriedly connecting the plugs, the red (positive) plug was joined to the negative lead, and the black plug to the positive lead!*

## CAN WE HELP YOU WITH YOUR SET?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

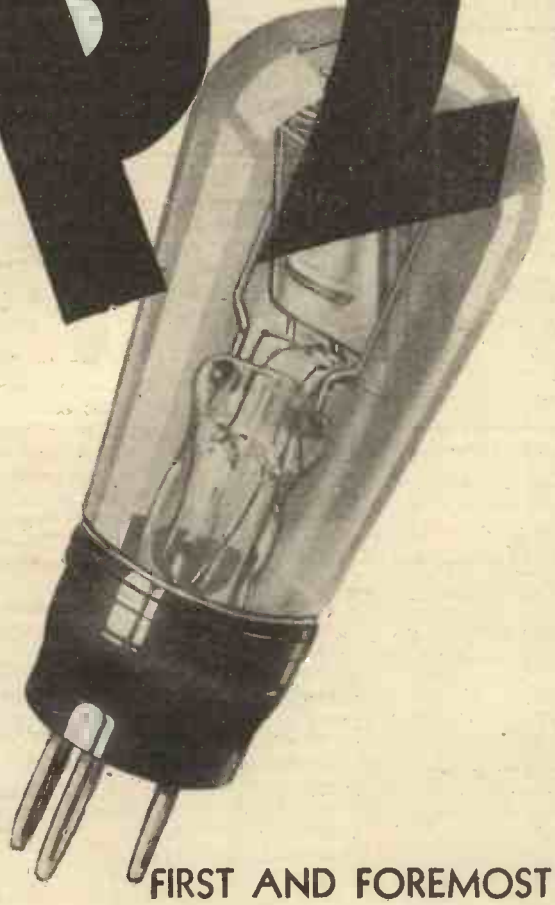
Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Steret, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form, you will know exactly what information we require to have before us in order to solve your problems.

**LONDON READERS PLEASE NOTE** Inquiries should NOT be made by 'phone, or in person at Fleetway House or Tallis House.

# This new MARCONI gives P2

## New Power— Richer Tone— to your Radio



Marconi valves, which led the way with the first dull emitter, the first British A.C. valve and the first practical screen grid valve, lead again with the P.2—an outstanding super-power valve with exceptional characteristics.

Here they are—Filament volts 2; filament current 0·2 amp.; magnification factor 6·5; impedance 2,300 ohms; mutual conductance 2·8—a lower impedance and a greater output than any other 2-volt 0·2 amp. valve!

Replace your present output valve with a Marconi P.2—and get greater volume, more power and richer tone.

It is *the* ideal 2-volt valve for use with all good speakers—cone or moving coil.

*Ask your dealer for the Marconi P.2—price 15/-.*

FIRST AND FOREMOST IN RADIO

G. Marconi

**The Marconiphone Company Ltd., 210 Tottenham Court Rd., London, W.1**

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 212.)

The ideal receiver would be one in which the tuning dials were always in step by numbers. That is to say, if the aerial tuning condenser were adjusted to five degrees, then the anode condenser should be adjusted to five degrees also in order that any station on that wave-length could automatically be picked up.

Then if the aerial were turned to fifty degrees, the anode dial also would have to be turned to fifty in order to pick up stations on *that* wave-length. Unfortunately, owing to small differences in coils, etc., the perfect matching of dial readings is very difficult, so that in practice when the dials are set the same, the circuits are not exactly in tune.

Probably your best plan is to set one dial (the one on which tuning appears flatter), and then to tune carefully on the other. For instance, suppose your anode condenser seems to tune very sharply and your aerial is not quite so sharp, then set the aerial first of all to, say, five degrees, bring the anode to five degrees, and then slowly turn the latter between 0 and about 10 degrees, to see if any weak transmissions can be brought in in this way.

If you pick up a station, tune it in on the aerial, then give a final touch to the anode condenser and note both the dials' readings for future reference. Carry on in this way by setting the aerial again at, say, ten degrees, tuning with the anode from five to fifteen this time, to see what can be picked up there.

When you get a little more expert with the set you will find that the easiest method to get both circuits perfectly in tune is to increase reaction a little, for generally when this is done the fact that the two circuits are exactly in tune is indicated by extra liveliness.

Keep a log of the different station positions and you will soon be able to tune in lots of them, for it will be found that the tuning dials do not vary but always have to be set at the same position for the same wave-lengths (unless, of course, you are altering the aerial coupling or causing some other marked variation in the inductance or capacity). Be very careful not to let the set oscillate, and do not listen for foreign stations while the local is working, as not only are they more difficult to pick up under such conditions but you may easily interfere with your neighbour's reception through not understanding exactly how the set should be handled.

If, however, you proceed as indicated above when the local station has closed down, you will soon find that the knack of keeping the two dials in step is really very easy to learn, especially if you do not complicate matters by attempting to use too much reaction. Too much is far worse than too little.

### ROME ON SHORT WAVES.

S. T. (Brixton).—"On the ordinary wave-lengths Rome has recently been a great favourite of mine, coming in on the loud speaker in fine style night after night (' Magic,' of course !).

"It has been so strong that I always said I should never be surprised at what they did, but I was wrong, for since using the short waves I got the surprise of my life. As far as I can tell it was about 25 metres where I was tuning when I picked up a tremendously strong carrier.

"Slackening off reaction, it came roaring in as "Raadjio Roma"—the same lady, same strength as 2 L O, with hardly any fading ! I am told that this is a harmonic, but wondered if anybody else has had a similar experience."

I am afraid you were misinformed. There is no doubt that this was not a harmonic you heard, but the new Rome short-wave station. Operating with a power of nine to twelve kilowatts, "Young Rome" has been working on a wave-length of 25 metres and 80 metres, and we have no doubt it was the former transmission you picked up.

### L.F. AMPLIFIER FOR LONG DISTANCE.

F. J. (Buckinghamshire).—"Nobody knows how much we have to thank the wireless for here. Although not thirty miles from London, the place is terribly lonely.

"Nobody could be more grateful than I for what the old crystal set has brought, but at last we are going to have a low-frequency amplifier to work a loud speaker.

"At first, we thought the pleasure of everybody hearing at once would be the height of enjoyment. But now a friend holds out the hope to me that we shall be able to hear FOREIGN stations as well.

"This is because on several occasions after the London station has closed down I was successful in picking up foreign stations on the telephones, and my friend tells me that when the amplifier is going it may be possible for us to hear them more distinctly and that other stations previously missed may come in as well. Is that right ?"

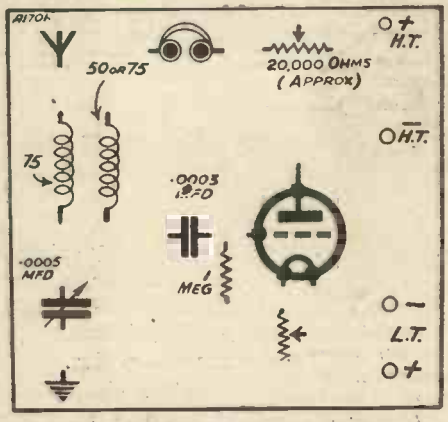
Theoretically, a low-frequency amplifier does not enable you to "reach out" (as a high-frequency amplifier would) but simply amplifies those stations already receivable. The London stations, previously clear on the 'phones, should now be heard at loud-speaker strength.

If you should pick up a foreigner, this station, too, will be amplified *in the same proportion* (though being much weaker than London before, it will, even when amplified, be much weaker than London when *it* is amplified). Probably you will not bag any fresh stations, but those you do get will now be much louder.

If just at first you do not pick up any foreign stations do not be discouraged, but remember that now the days are getting longer and longer it becomes more and more difficult to get foreigners on simple sets, owing to the effect of daylight. But when summer has gone, and the nights get longer, the foreign stations return again and all wireless improves just at the time of the year when it will be most appreciated !

Moreover, there is a chance that foreign stations which previously were just too weak for you to hear will now be strengthened just sufficiently to be audible. So that, altogether, you should find in your L.F. amplifier a field of fresh possibilities, especially if you take care to keep your aerial and earth efficiency as high as possible.

## POPULAR "WIRELETS" No. 9




The "components" shown in this sketch are those necessary for a one-valve "Chitos" receiver—which, you will remember, was one of the most popular single-valvers that ever first saw the light in "P.W." Can you "wire up" this circuit ?

(Look out for the answering diagram next week.)

### WHERE DOES INTERFERENCE COME FROM ?

"MICKY MOUSE" (Leicester).—"Does the electrical interference on broadcasting come down the aerial like broadcasting or does it come straight to the set itself ?"

Different kinds of interference affect the receiver in different ways. Very often the aerial or the earth lead picks it up (as may sometimes be proved by disconnecting the respective lead, when interference appears to cease).

Common instances of this kind of interference are oscillation received from some neighbour's set, and the crackling interference which is caused by leaky power or other electrical lines running near to the receiving aerial.

In a house in which there is powerful electrical apparatus, or electric motors such as used on dentists' drills, vacuum cleaners, or similar devices in which sparking can occur, the interference may not be coming via the aerial so much as direct through the walls, floors or ceilings, or via any common wiring which may be in use.

In many cases lighting or power mains in the house are attached to powerful electrical apparatus not far away, and disturbances from this are thus brought near to the receiver and so are introduced to the set neither from the aerial, nor directly through the air, but along the wiring. It is because of the many varieties of interference which exist in large towns and of the many different ways in which these can be received, that the problem of interference is such a big one.

In practically all cases the characteristic noise caused by the interference gives a good hint as to its source. The best plan therefore is to advise the B.B.C., describing the trouble as faithfully as possible, when they will do all in their power to remove it.

## A NEW BOOK ON TELEVISION.

NOT only the harassed old hand, but also the comparative newcomer to wireless will be interested in any book which elucidates in simple language the methods employed to-day for transmitting and receiving the images of living, moving subjects by wire and wireless.

The explanations in "Television To-day and To-morrow,"* are very well done. Anyone who reads through the chapters devoted to this aspect of the subject will find that he has a clear conception of the methods employed in the Baird process, which is that used for the transmissions that take place daily from Brookmans Park.

It is a pity, perhaps, that more space is not devoted to other systems, for several besides that of Mr. J. L. Baird are attracting attention to-day. Mr. Moseley, one of the joint authors, is, of course, Publicity Manager to the Baird Company, but one would have expected that something more than mere passing reference in the early chapters and a section of five pages at the end of the book dealing with "Television in Other Countries" would be devoted to the work of the Bell Telephone Company, Jenkins, Mihaly and Alexanderson.

**Too Optimistic ?**

The meagre amount of space given to other systems is all the more surprising since in his introduction Mr. Moseley complains that American books on Television have furnished a wrong impression of the subject by saying too little about Mr. Baird.

It is, however, refreshing to find that running in double harness with a collaborator has had the effect of moderating the transports that we had come to associate with Mr. Moseley's writings upon Television; in the present work he neither answers criticism by invective nor indulges unduly in laudatory superlatives concerning the Baird system.

"Television To-day and To-morrow" is a little too optimistic in stating that the televisor in its present form is far less complicated to handle actually than a normal wireless receiver.

The televisor must be used in conjunction with a particularly good wireless receiving set; it is to the eye what the loud-speaker is to the ear. Thus the wireless set itself has to be handled (two wireless sets if speech and vision are received simultaneously), and in addition there are the controls of the televisor, which require constant attention and delicate adjustment in order to hold the image.

**Some Useful Circuits.**

A useful section of the book is that which deals with the best form of receiving set to employ with a televisor. Circuit diagrams are given and the reasons why certain points must receive particular attention are clearly stated.

There are also highly interesting chapters on Noctovision, Phonovision, and Colour Television.

R.W.H.

* Television To-day and To-morrow, by Sydney A. Moseley and H. J. Barton-Chapple. Pitman, 7s. 6d.

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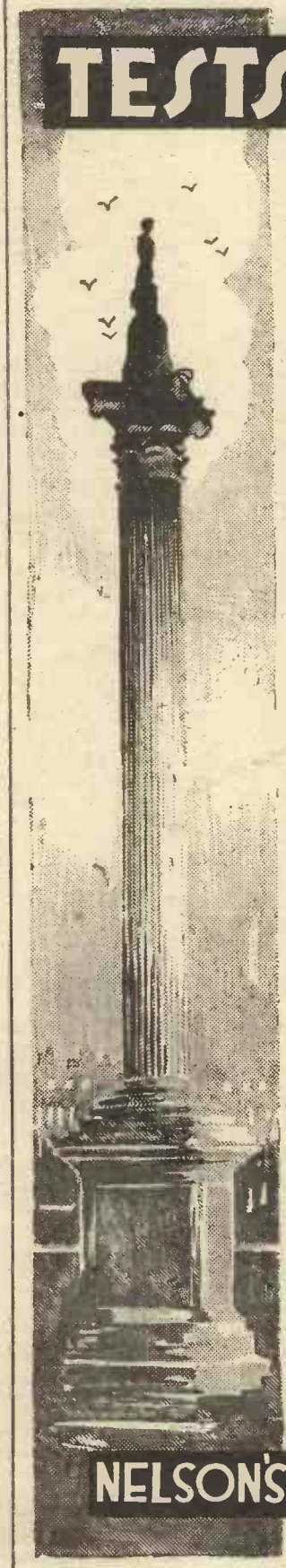


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TECHNICAL NOTES. By Dr. J. H. T. Roberts, F.Inst.P.

# COUNTERPOISE EARTH.

**WATTAGE PROBLEMS—RESISTANCE AND TEMPERATURE—SIMPLE CALCULATIONS.**

MY remarks recently on the question of the counterpoise earth have brought me a number of enquiries from readers who either have problems connected with their present counterpoise earths, or who desire to introduce a counterpoise owing to a difficulty in making a satisfactory ground earth.

In one letter in particular, which is rather interesting, the writer describes his local conditions as being very unsatisfactory owing to the fact that the ground is full of chalk, and that there is no water laid on for a waterpipe connection.

Although these conditions are certainly unusual, there are no doubt other readers who find themselves in somewhat similar difficulties, and this is clearly a case where a counterpoise earth should be, at any rate, tried out.

As space is short, I will not repeat the directions for making a counterpoise, as these were given in these Notes some few weeks back.

### Wattage Problems.

A small problem from another reader relates to the use of different types of electric lamps as resistances, and to the power consumption. In particular he wants to know whether two 50-watt lamps in parallel will consume one unit in 10 hours.

In 10 hours a 50-watt lamp will obviously consume 500 watt-hours and two such lamps in parallel will consume 1000 watt-hours, that is, one unit. Of course, this is on the assumption that the lamps are fully illuminated ; that is, that the full-rate voltage is applied to them.

My correspondent does not describe the way in which he is using these lamps as resistances, but it is very likely that they are used together in series with some other apparatus. In this case, the actual consumption is best calculated from the current passing.

The energy consumption will be expressed in watt-hours and will obviously be equal to the number of watts multiplied by the number of hours during which the current is flowing. Now the watts consumption is equal to the voltage of the mains, multiplied by the current in amperes, so that the watt-hours will be equal to the mains voltage multiplied by the current in amps., multiplied by the time in hours.

Inasmuch as 1000 watt-hours constitute one unit, all you have to do is to divide the above-mentioned figure for the watt-hours by 1000 and you have the number of units.

### Resistance and Temperature.

For example, let us suppose that the mains voltage is 220 volts and the current passing through the apparatus is $\frac{3}{4}$ amp., and the total time during which current flows is 5 hours, then the watts will be equal to 220 multiplied by $\frac{3}{4}$, that is 165 watts ; since this is flowing for 5 hours we have a total of 825 watt-hours, that is 0·825 of a unit.

It may be useful to remark, in passing, that if a lamp is used as a resistance in series with other apparatus its resistance will be rather less than when working under normal conditions.

The result is that the current actually consumed in the lamp will not be quite proportional to the voltage applied to it. As you probably know, the electrical resistance of most substances, and particularly of metal wires, increases as the temperature is raised.

If the resistance of the lamp were absolutely constant and independent of temperature, then clearly the current consumed by the lamp would be proportional to the voltage applied to the lamp.

### Current Consumed.

The current consumed is equal to the voltage divided by the resistance, and therefore the watts consumption is equal to the square of the voltage divided by the resistance.

Three different ways of expressing the watts consumption are, first, the current multiplied by the voltage ; second, the square of the voltage divided by the resistance and, third, the square of the current multiplied by the resistance.

(*Continued on page* 218.)

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## FOR THE LISTENER.

(*Continued from page* 198.)

bursting instrument. And I knew the Besses o' th' Barn Band. Yes, I can see how the highbrows are raising their eyebrows!

### A Rare Talk.

One of the most interesting talks I have heard for a long time was Captain Tweedy's account of the Samaritan Passover, at Nablous, the only remaining example of a blood sacrifice among the Jewish race to-day. It takes place on a plateau at the top of Mt. Gerizim, 2,000 feet above the town.

The burnt offering consists of seven lambs, which are slaughtered and roasted amid scenes of most thrilling excitement. There are only about 130 Samaritans left ; they are dying out by in-breeding, but they have a tradition of 3,000 years behind them. Captain Tweedy's account of this amazing ceremony was graphic in the extreme, and he managed to give us the atmosphere extraordinarily well.

### Good-bye !

To the Naval Conference. Mr. Vernon Bartlett was glad it was over. So am I. He sounded almost frivolous, like a schoolboy running out into the playground for a break.

**NEXT WEEK**

The forthcoming issue of "P.W." will contain full details of

**THE "ECONOMY" THREE**

DON'T MISS THIS FINE SET!

He was within an ace of telling us how he bought a secondhand motor-car in Rome, sold it again in a fortnight's time at a loss of £60, and gave a dinner to celebrate his getting rid of it !

No doubt that night he had had a dinner to celebrate getting rid, for a while at any rate, of "globular tonnage and parity!"

### Entertainment.

Easter was rather depressing this year. Stainless Stephen seemed to be feeling the effects of it, and George Clarke had a thin time. But I give full marks to Rudy Starita, who played raindrops marvellously on the xylophone.

I was able to compare it with the real thing, for the raindrops were at the moment playing equally marvellously on my window-panes. Vivienne Chatterton sang a good song, "Maypole," with harpsichord accompaniment ; but I couldn't hear all the words.

I missed nothing, however, of Ethel Lodge's Welsh Monologue, which was very good. And Constance Wentworth can sing to me (with a little less piano, please) "Oh, pretty Polly Oliver" as often as she has a mind.

### Looking Forward.

I hope I may not miss Elena Gerhardt in a song recital on May Day ; Fanny Davies, playing Schumann's piano concerto in A on the 2nd ; or Mason's "Four Feathers," produced by Cecil Lewis on the 7th. There are lots of others, but I have put an asterisk against these.

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# Dr. Sun and Dr. Work as Partners

The value of the Sun as a giver and restorer of health was never more firmly held than at the present time. Clinics for sun cure are to be found all over Europe, but the difficulty hitherto has been the financial support of the patients. The poor can receive charity, and the rich can pay, but the middle classes, too proud, and often ineligible, for free treatment, and too poor to be able to pay the heavy charges, have been in difficulties. A great idea has just been put into practice in Switzerland by the founding of a clinic in which the patients, while receiving sun treatment, can earn their own livings. In this week's THIS and THAT there is an account of the interesting experiment.

Among other intensely interesting features in this issue, too, there is

## The Trials of a Cabinet Minister's Wife by Mrs. J. R. CLYNES

Doubtless there are folk who envy Cabinet Ministers and their wives, and think that they live in the lap of luxury, with plenty of time for pleasure and recreation, and not too much in the way of duty to perform. Vastly different from this imaginary picture is the real life of those in high places, and in this article Mrs. J. R. Clynes, the wife of the Home Secretary, tells us vividly of the trials and difficulties of a Cabinet Minister's wife. It is an absorbing and intimate article, which is well worth reading. Make sure of every issue of

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# TECHNICAL NOTES.

*(Continued from page 216.)*

**Simple Calculations.**

These three very simple formulæ show how the wattage varies where the current or the voltage or the resistance varies. For example, if the current is constant, the wattage is proportional to the voltage, and if the voltage is constant it is proportional to the current.

If the resistance is constant the wattage is proportional to the square of the voltage, so that if we assume the resistance of the lamp to be constant and we reduce the voltage to half, this quarters the wattage consumption. If the voltage is constant the wattage is inversely proportional to the resistance.

Again, if the current is constant the wattage is proportional to the resistance, whilst if the resistance is constant, the wattage is proportional to the square of the current. Therefore, in the above illustration, if we assume the resistance of the lamp to be constant we see that doubling the current produces four times the wattage consumption.

This is easy to see, because to double the current for constant resistance we have to double the voltage. We therefore have twice the current at twice the voltage, that is, four times the wattage.

**L.T. Problems.**

A reader wants to know why it is not possible to use a low-tension charger as an L.T. eliminator by simply joining its positive and negative terminals respectively direct to the positive and negative terminals of the set.

Alternatively, he wants to join the positive output terminal of the charger to the positive terminal of a 2, 4, or 6-volt accumulator and then on to the positive terminal of the set, and the same with the negative terminal.

This is a question which often crops up and the answer to it is comparatively simple. In the first place, as regards using the charger directly connected to the set, this will not be satisfactory in practice because, in the first place, the charger will probably not deliver a sufficient current to light the valves properly, whilst in the second place there is no particular smoothing device included in the charger.

You must remember that the output from a charger is intended to be fed into an accumulator, and it is of little or no importance whether this output is particularly smoothed, that is to say, free from hum or ripple.

When it is fed direct into the set, however, the question of hum or ripple becomes of vital importance, and before the charger can be converted into an effective L.T. supply unit it must have a very efficient smoothing system, consisting of heavy chokes and condensers, incorporated in it. This makes it a much bigger and more expensive job than a mere charger.

**"Floating" Battery.**

As regards the connection to an accumulator, however, this makes a complete difference to the situation and the accumulator, which is sometimes described as "floating" across the leads from the

*(Continued from page 219.)*

**'POPULAR' TRANSFORMER**

Make your new set a better set with the Brownie POPULAR Transformer. Although it costs only 9/6, its purity of amplification gives a more vivid clarity of reproduction throughout the musical scale, while its sturdy British build ensures that once it is fitted the words "transformer troubles" can be eliminated from your list of worries.

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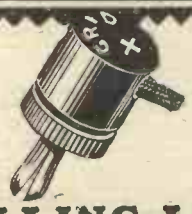


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## TECHNICAL NOTES.

*(Continued from previous page.)*

output of the charger to the input of the set, acts as a "buffer" and tends very largely to absorb any irregularities in the output.

As a matter of fact, a "floating" accumulator used in this way is often a much more effective smoother than an extensive system of chokes and condensers, and the main objection to it is that it introduces a "wet" element and one requiring attention, whereas one of the main *desiderata* in an L.T. supply unit is complete freedom from the need for attention.

**Question of Type.**

Notwithstanding the very great smoothing effect of a floating battery, I should still point out that not all types of charger are suitable for connecting to the set even with a battery across. There are some kinds of irregularities which are not smoothed out even by a battery in this way.

## TECHNICAL TWISTERS

### No. 8.—OHM'S LAW.

**CAN YOU FILL IN THE MISSING LETTERS?**

**Ohm's law shows the relation between . . . . . and . . . .**

**If . . . of these factors are known, the . . . . . can always be calculated.**

**The number of . . . . is always equal to the number of . . . . . divided by the . . . . . .**

**Conversely, the number of . . . . . equals the . . . . . divided by the . . . . . in . . . .**

**Last week's missing words (in order) were Current, Excessive, Negative, Negative, Positive, Positive.**

If you wish to use a charger and a battery, it is much better to adopt the well-known method of having a double-pole double-throw switch, with the battery connected to the centre, the set to one side and the charger to the other, so that the battery is thrown either on to the set or on to the charger, but the set is never connected to the charger. This system requires a certain small amount of attention, but apart from that it works perfectly.

**Set-Working Economy.**

I have been asked by a reader, who describes his set in detail, whether I consider that an anode current of about 30 milliamps (it is a three-valve set) is too much and, if so, how it should be reduced.

As I have no diagram I cannot illustrate the circuit, but it is pretty clear that a current of 30 milliamps is far too high and one of the reasons is that a wrong type of valve is being used in one of the positions, whilst also the grid-bias applied is insufficient.

*(Continued on next page.)*

# CONVINCING PROOF!

". . . . we have put the Lotus All Mains Receiver to a severe test and have found the performance far superior to all others tested by us. We were able to log forty-two stations at full loud speaker strength, the quality leaving nothing to be desired." W. G. S. (Bristol).

Simplicity itself to operate, the Lotus 3-valve S.G.P. All-Electric Receiver requires no batteries. Simply plug in to any A.C. electric supply for unfailing power for less than a ¼d. a day. Cash Price **£21**, or **£1 : 19 : 9** down and eleven similar monthly instalments.

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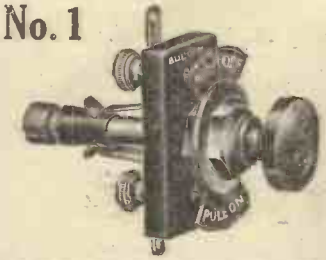
BULGIN RADIO PRODUCTS

FACTS ABOUT "SWITCHES"

No. 1



SWITCH ON—SWITCH OFF—SWITCH ON—switch off—and so day after day, week after week, and year after year—a switch, the hardest-worked component in a set—must perform its work faithfully. Take a BULGIN Switch; note the resilient, pure nickel silver contacts, and general superior sound engineering design, and you will see for yourself that every detail has been carefully thought out, to make it without doubt "The Perfect Push-Pull Switch." Illustrated here is the S.22, De-Luxe "On" and "Off." Price 1/6 Each.

OVER 60 OTHER TYPES AVAILABLE.

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JANE DOE

Britain's leading woman journalist, contributes the second article of a trenchant new series on modern life to this week's grand issue of ANSWERS.

EVERYDAY SINS

is the most outspoken journalistic feature of the year. In this week's issue, too, there is a great "open air" competition in which a Morris Car, a B.S.A. motorcycle and Mead cycles, must all be won for phrases of four words or less. Make sure of *your* copy.

ANSWERS

*Buy YOUR Copy NOW* - - 2d.

# TECHNICAL NOTES

*(Continued from previous page.)*

This emphasises once more the importance, which I have mentioned previously in these Notes, of using the proper value of grid-bias voltage. It is a very simple and inexpensive point, but one which makes for great economy in the working of the set and which also contributes greatly to satisfactory results.

### Talkies.

I often receive inquiries from readers with regard to the operation of talking pictures, and many readers send me suggestions as to how the talking pictures could be improved, these suggestions mostly relating to improvements in the loud-speaker reproduction system and the pick-up from the film or record.

### Film or Disc?

Incidentally, the question often arises as to whether the sound-on-film or sound-on-disc system is preferable. Some people seem to think that the sound-on-disc system is superseded and is becoming obsolete.

This view is based upon the idea that the sound-on-film is more convenient, owing to the fact that the synchronisation is more or less automatic, that is to say, the sound is registered on the same film as the pictures and, therefore, if there is a breakage, or anything else happens to the one, it also happens to the other.

### A Ticklish Job.

As a matter of fact, the sound-on-disc system is far from being obsolete, and is indeed coming more and more into favour, owing to the great manipulative and other difficulties connected with the sound-on-film system.

It is true that there is a certain convenience in regard to synchronisation in the sound-on-film system but, apart from this slight advantage, it appears to have many very serious disadvantages as compared with sound-on-disc. For one thing, the picking up of the sound from the film involves the use of a very delicate and refractory photo-electric device as well as a large amount of extra amplification.

The amplifier for this purpose also has to be operated under the strictest possible precautions.

## FOR THE CONSTRUCTOR.

**If your L.F. transformer has exposed leads to the windings remember that a break in one of these or a faulty connection will give the same symptoms as a "burn out."**

* * *

**Old variable condensers which have become noisy in operation can be cured, if the trouble is due to poor pressure contact in the moving vanes, by fitting a flexible pigtail contact.**

* * *

**Although sometimes used for the purpose of panels, slate is a very poor substitute for ebonite, as its insulating qualities are variable and often poor.**

### IMPEDANCE OF A.C. VALVES.

In the advertisement of Mazda All-Mains Valves in last week's "P.W." the AC/SG type's impedance was given as 60,000 instead of 600,000 ohms.

BUY FOR CASH

AND SAVE MONEY! Send List of Parts you require and see if our CASH QUOTATION meets your wishes.

OUR MARVELLOUS 3-VALVE LOUD SPEAKER RECEIVERS

A Wavetrap is incorporated in a special P/M Coil 200/2,000 metres. Magic separation of stations. Above Receiver (assembled in Oak Polish Cabinet, hinged lid), 2 L.F. Transformers, complete with 3 Tungsram Valves (1 Power), Battery Cords, Grid Bias, 2 good slow motion Dials. Ready to fix to Aerial. 67/6 Carr. & Packing, 5/-

Built for National Regional Midland and Foreign Programmes

R. BURTON, Radio Manufacturer, 72, Dean St., Soho, London, W.1. (Next Door to Royalty Theatre).

HANDYMEN with WOOD or METAL

A postcard to STROUD'S, 2, Market Terrace, Chadwell Heath, Essex, will bring something to your advantage concerning Materials and Service.

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The first firm to supply Wireless Parts on easy payments. Five years advertiser in "Popular Wireless." Thousands of satisfied customers. Send us a list of the parts you require, and the payments that will suit your convenience, and we will send you a definite quotation. Anything wireless.

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SELF-CHARGING, SILENT, ECONOMICAL JARS (waxed), 2½" × 1½" sq. 1/3 doz. ZINCS, new type 10d. doz. Sacs 1/2 doz. Sample doz. (18 volts), complete with bands and electrolyte, 4/1, post 9d. Sample unit, 6d. Illus. booklet free.

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Let me make you an offer for YOUR OLD SET in part exchange for any new Receiver. Please send full particulars of your present set and one required. Send for free list of cheap components. —E. BUTLIN, 143b, Preston Road, Brighton.

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This Super Set, at a staggeringly low price, contains a wonderful new tuning circuit, and is extremely simple to build and operate. It is amazingly selective, so that you have no trouble from interference from your local, while it will pull in stations by the score.

**Only One Tuning Condenser—No Ganging—Selective—Sensitive—Superlative!**

The "STAR-TURN" THREE is fully described in The MAY

# MODERN WIRELESS

which also contains an extremely novel feature

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It tells you all about those foreigners; how to get them; when to hear them; it gives hints to enable you to get the best from your set; and is

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Printed and published every Thursday by the Proprietors, The Amalgamated Press, Ltd., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: Messrs. John H. Lile, Ltd., Ludgate Circus, London, E.C.4 (Telephone: City 7261). Registered as a newspaper for transmission by Canadian Magazine Post. Subscription Rates: Inland and Abroad, 17/4 per annum; 8/8 for six months. Abroad (except Canada), 19/6 per annum; 9/9 for six months. Sole Agents for South Africa: Central News Agency, Ltd. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd. Saturday, May 3rd, 1930. S.S.

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## REGIONAL SCHEME PROGRESS. By Captain Eckersley

# Popular Wireless

Every Thursday
PRICE
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No. 414. Vol. XVII. INCORPORATING "WIRELESS" May 10th, 1930.

*In this Issue*

## THE "ECONOMY" THREE

*Also in This Issue*

DX Listening
Modernising Old Sets
By Victor King
Rain and Radio
In the Early Days
By Kate Winter
Mixing Your Currents
Latest Broadcasting News
Etc., Etc.

LONDON— WITH A PUSH

By a simple action—a push of the thumb—it is now possible with this marvellous new component to switch over from the long wave to the short wave band *without changing Coils*—an irksome task at the best of times. Just plug in your medium and long wave Lewcos Coils (binocular or super coils) on the Twin 6-pin base, and by the operation of the push-pull switch either coil can be brought into action. Tests prove that the London stations were never more easily and quickly eliminated in favour of stations on the long wave band. Of course it is necessary to also alter the tuning condenser settings.

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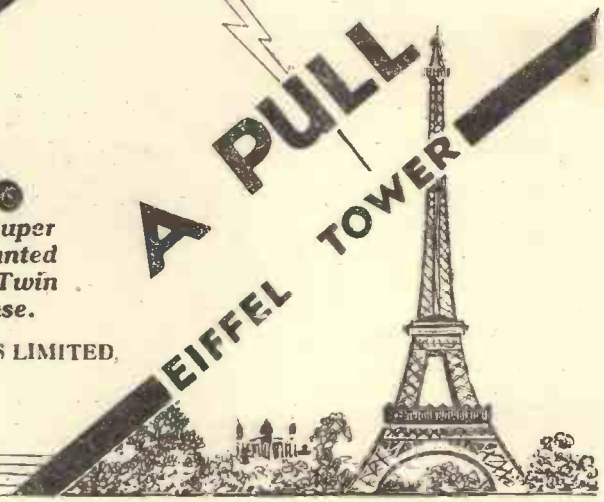

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# Popular Wireless

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Chief Radio Consultant:
CAPT. P. P. ECKERSLEY, M.I.E.E.
Editor: NORMAN EDWARDS.
Technical Editor: G. V. DOWDING, Assoc.I.E.E.
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CAR RADIO.
LEARNING MORSE.
LISTEN TO THIS!
SUBTERRANEAN CLUB.

OLD L.T.B's.
HEARD THE 'ELETTRA'?
TROUBLE IN ERIN.
"TALKIE" MORSE.

## RADIO NOTES & NEWS

### Car Radio.

FOR the first time in my life, I have taken a trip in a car equipped with a radio receiver. Not very favourably impressed! I found that while we were passing through busy towns, and were inclined to sit back and listen, the purr of our car and the noises of the traffic made listening a matter of strain. Conversely, out in the country, I found it difficult to concentrate on the radio. When we were at anchor and the lunch-basket was open, music gave us a pleasing background; but, then, a portable would have been more convenient. (N.B.—I wish someone would invent a *glass* stopper for thermos flasks!)

### Improving Fibre.

MUCH obliged to the kindly reader who sent me two fibre needles. One got lost in the post, but the other "stood up to" a Brahms' symphony and then went through a Brahms' piano concerto excellently. Unprecedented, in my short experience!

I notice that the fibre was darker than that usually supplied. Is there some dodge for treating these needles—some hardening process? This one looked as though it had been soaked in oil and baked. Where can one obtain this hardy type of needle?

### Learning Morse.

S. K. (Wallasey), who is learning to manipulate a Morse key, asks which is the correct position for the key. Should it be so placed that the elbow rests on the table, or vice versa? Matter of partiality, I believe, though it seems to be a sound practice to rest the arm, if possible. I advise the elbow rest and a "touch" which moves the forearm as little as possible.

Have the key facing your breastbone and a foot or fourteen inches away, and send from the wrist. Then he asks, "What gap should be between the contacts?" There may be some recommended size, but I would suggest one-sixteenth of an inch as a maximum. Can some of the telegraphic experts help us in these two matters?

### Where the Business Goes.

SOME time ago, I used to get into trouble for complaining that the radio trade was in the hands of the plumbers, oilshops, and bicycle merchants. Every tinker with a lean-to workshop, I said, calls himself a radio engineer now!

The U.S.A. Department of Commerce, in an analysis of the business there, states that during the period reviewed only 40·5 per cent of the total retail radio trade was transacted by exclusively radio dealers. Furniture shops took 10·5 p.c.; music dealers, 9·98; departmental stores, 9·65; motor dealers (including petrol stations and accessory dealers), 8·8; dealers in electrical goods, 4·9; hardware dealers, 4·34. The remainder of the trade was secured by *jewellers, druggists, and retailers in seventy-two other lines of business!*

### ROTTEN ROW?

This enthusiast listens-in, even when on horseback, by means of a frame aerial and special set slung beside his saddle. But nobody knows what the horse thinks about it!

### Listen to This!

JUST in case you may not have noticed it before, or as a reminder, may I call your attention to an item which is scheduled for 8 p.m. on May 23rd, when Mr. Stanford Robinson is to conduct Mendelssohn's "Elijah" at the Queen's Hall, the vocalists being Stiles-Allen, Muriel Brunskill, Frank Titterton, and Keith Falkner? No "high-brow" matter in this, but delightful, straightforward music with noble orchestral and choral effects. Try that new loudspeaker on it!

### Combined Attack on Romance.

I EXPECT that the news about Tintagel parish church will come as a blow to many who have visited there and dreamed dreams of Sir Huon and the fairies. Not sold to America? No! Not being pulled down to make room for a "petrol pump station"? No! Not burned down? No! But it has been equipped with a radio-gramophone and four loudspeakers! I wonder why? For the church has an organ, and I believe that Cornish folk can still play and sing.

### A Subterranean Club.

I HOPE that the "cellar" of St. Jude's Vicarage is underground, for if it is not, then my title is spoiled. It was a splendid move on the part of the vicar of St. Jude's, Old Bethnal Green Road, London, E.2, to start a wireless club, and give it a fitted workshop in the cellar of his house, and it deserves appreciation in some practical form, I think.

The club is short of millionaires, and the available store of components is just about exhausted, so if anyone will put himself out enough to wrap up a few odds and ends not required for "Magics" or "Titans," and send them to the dug-out mentioned above, doubtless the blessing of the gods will fall upon him and his tribe, flocks and herds, etc.

*(Continued on next page.)*

# NOTES AND NEWS

(*Continued from previous page.*)

### Old Accumulators.

THESE, as I said, would not be despised by hospitals, who seem to live largely on scrap metal. If you really have one or more carcases of secondary cells whose house-room you covet, Mr. A. Rubenstein, A.S.M. 61st Hackney Troop, Boy Scouts, promises that if you will drop them—I mean, gently lay them down—at 72, Farleigh Road, London, N.16, they will be added to the collection of paper and metal made by the Hackney Rover Scouts for the Red Cross and hospitals.

These human jackdaws have collected no less than 800 lb. of foil, etc., in three years. Thank you, sergeant!

### New Worlds Wanted.

AN interesting glimpse of the natural Marconi against the background of his genius is afforded by Mr. D. Sarnoff, of the Radio Corporation of America. The great man has a grumble.

The world, he is reported to have said, is too small, and that's what's the matter with the whole wireless situation. In effect, he said, "A chap like me hasn't room to move." He complains that a short wave hikes three times round the globe before it settles down, and rings the bell every time it ends a lap. Never mind; Mars remains, and there is quite a piece of universe unoccupied yet.

### The Theremin Again.

THE "Theremin," the new "musical" instrument which is simply a "howling" valve circuit, the "howl" of which is varied by approaching and withdrawing the hands, is being pushed to the forefront in the U.S.A., and its sponsors have actually succeeded in having it incorporated in a vaudeville act which "features" two people playing the thing solo and in duet.

It is said that the public shows considerable interest in the act. People will gape at someone performing with a spoon and a tin plate, accompanied by a barrel-organ.

### Heard the "Elettra" Yet?

THERE is a good chance of your hearing Marconi hard at work in his yacht, pursuing those researches which may mean so much to the world, if you can but pick up the "Elettra." Something to tell the children, eh? "Yes, I heard him working from Italy to New Zealand."

L. C. (Birkenhead) has had the luck to find the yacht, and hear Mr. Mathieu, the inventor's assistant, talking to the U.S.A. He has also been getting the Sydney telephony station regularly, but unfortunately he gives no details of his receiver. A "Magic," I suppose!

### Wireless and Birds.

A CONTEMPORARY "daily" has been harbouring letters from people who accuse broadcasting stations of upsetting their feathered friends. One lady had to destroy two linnets which, she alleged, suffered acute distress during the hours of transmission from a station three miles away.

Another person is so sure that his canary is being slowly electrocuted that he "earths" its cage. Has anyone some clear evidence that birds—or any living things—are caused distress by feeling (as well as hearing) broadcasting?

### More Trouble in Ireland.

ARISING in Aughnacloy! The entire body of listeners, numbering twenty, have risen in revolt against the powers who pump water into the public reservoir, a process which, they say, interferes with the reception of broadcast programmes. They demand of the Clogher Rural Council that the offending pump shall be restrained from functioning after six o'clock.

After all, what is mere water? I wonder what would happen if a distillery nearby blotted out the programmes? A frightful fix for Aughnacloy!

### Has the B.B.C. Failed?

ACCORDING to "Callisthenes," who writes a bit for Selfridges every day in the "Times," British Broadcasting has failed. That is an assertion on which we could all talk fluently, I have no doubt, but the steady increase in the number of licenses issued year by year is very damaging to the failure theory, isn't it?

Moreover, it should be realised that the whole business is now on a basis quite different from that of 1922; radio is no longer a novelty, and people are beginning to tire of listening-in all the evening every evening. There *are* other interests.

### Car Radio Banned.

IF at any time you should visit St. Paul, Minnesota—such things are done!—do not take a short-wave receiver with you in a motor-car lest you suffer arrest by some truncheon-swinging, "gun-packing" policeman. For such wickedness cannot be permitted in St. Paul, Minn., where only the police are allowed to move a short-wave set from one point to another by means of automobile transport.

It is, however, incorrect to state that in Snooper's Butte, Te., the law prohibits the carriage of bacon-slicers in wheelbarrows!

### Summer "Talks."

WITH an optimism which I cannot share, or with a lack of psychological understanding which is serious, the B.B.C. produces its programme of summer season "talks." It is now too late to dislodge the B.B.C. from the position it has taken up in relation to our minds; one can but hope that some day this "radio titbits" idea will be discouraged.

"Digging up the Past"—sounds like washing dirty linen in public! "Bird Watching and Bird Behaviour," "The Behaviour of Apes!" No! I'll go and give the lawn another rolling.

### The Radio Theatre.

IN a new building in New York a theatre has been opened on the scene of the former frolics of the Ziegfeld Follies. The actors are really broadcasting artistes at work before the microphone and the public watch them through a mighty sheet of glass which replaces the usual stage curtain and which is necessary in order to keep the murmurs of the audience off the ether.

The spectators hear the proceedings through loud speakers, and the connection with the radio system outside is made through twenty-two microphone outfits. What on earth next?

### Popularity of Radio.

THE Union International de Radio-diffusion, Geneva, in its annual survey gives the relative numbers of receiving licences held by listeners per 1,000 inhabitants in 1929. Of the 18 European states where licences are issued Denmark heads the list with 87·93, Sweden being second with 70, and Great Britain third with 67·1. Austria beats Germany with 56·2 as against 49·1. Italy, the fatherland of Marconi, has 2; compare this with Latvia's 15·4 or Estonia's 13·8. Roumania has 1·7.

These figures, do not in themselves indicate the number of licences held, for Germany which is fifth had at the time of compilation over three million licences "alive," and Denmark less than half a million.

### Morse in Talkie.

IF you have not yet heard the British "talkie" film of "Journey's End," you have missed what in my opinion is a high-water mark production and a most impressive little story which every lover of peace should see. I was however, sadly distracted by the sound of a buzzer which occasionally burst into a chatter in the "dug-out" scenes. Whether or not it was genuine Morse I failed to detect because my attention was elsewhere directed. Has anyone read this buzzer?

Further, I could not observe that anyone in the play paid the slightest attention to the buzzer. Is that a flaw in an otherwise realistic and convincing piece of work?

ARIEL.

## SHORT WAVES.

"Bring wireless within reach of all," says a heading. All I want is to be brought within reach of the set next door.—"Daily Herald."

* * *

"Wireless telephony is to replace telegraph and telephone wires in the South-West Africa territory, owing to the costly damage done by elephants, giraffes and monkeys," we read in the "Evening News."

Would it not have been wiser to pacify those animals, rather than add to their annoyance in this manner?

* * *

First Father: "I'm spending a lot of money on my daughter's vocal and instrumental music lessons."

Second Father: "That's foolish—a radio is cheaper, and you can get just as terrible stuff over it."—"Inverness Courier."

* * *

"NOISES OFF."

Grandpa was having his after-lunch s'eep in the armchair, and emitting sounds that might easily have come from a cross-cut saw.

As father entered the room, he saw little Daisy twisting one of grandpa's waistcoat buttons.

"What are you doing?" he whispered. "You mustn't disturb grandpa, Daisy."

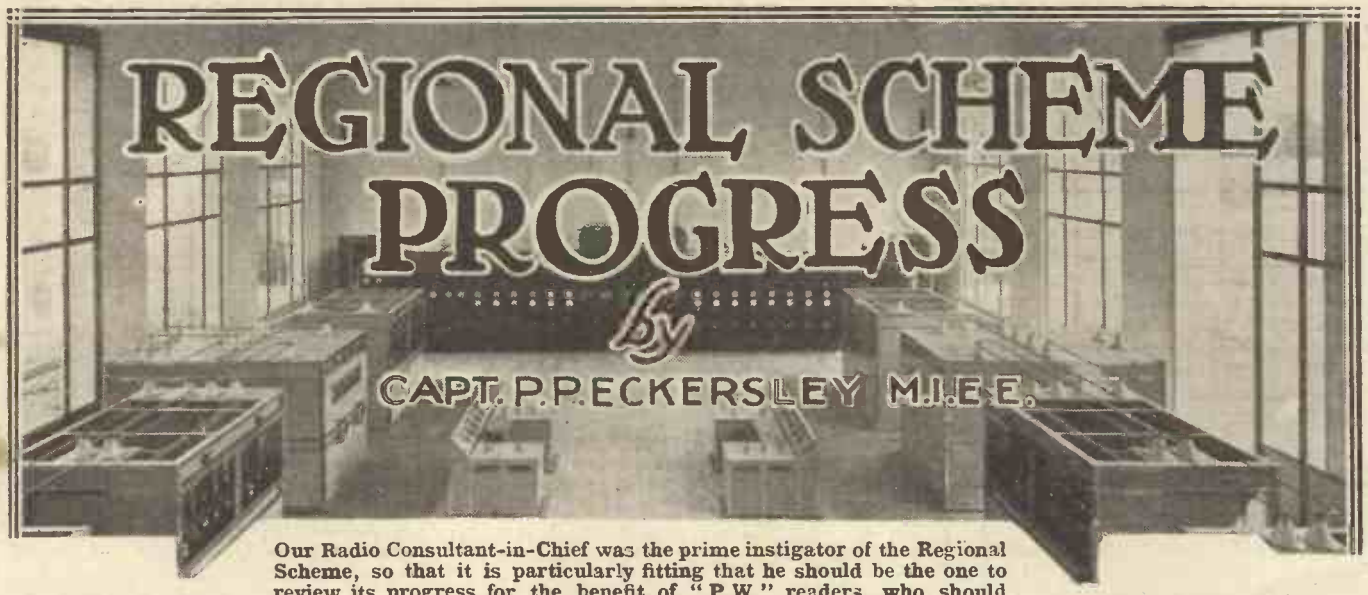
"I'm not disturbing him, daddy," explained the child. "I was just trying to tune him in on something different to what he's giving us."—"Answers."

* * *

A CYNIC OF SYMPHONIES.

If I ask the B.B.C., do you think they will have an announcer at their Symphony Concerts to give out when the orchestra is tuning-up and when it is playing? We are finding it very difficult to tell the difference.—G. E. H.—"Daily Sketch."

# REGIONAL SCHEME PROGRESS



by CAPT. P. P. ECKERSLEY M.I.E.E.

**Our Radio Consultant-in-Chief was the prime instigator of the Regional Scheme, so that it is particularly fitting that he should be the one to review its progress for the benefit of "P.W." readers, who should find this article of especial interest.**

TAKING it by and large, the technical side of the Regional Scheme in London can be definitely considered a success. For years the opposition to the scheme has argued that it would cause so much "dislocation" that the outcry against it would result in failure.

### Disadvantages and Advantages.

This sort of criticism comes from the type of people who were taught to be cautious but not to think, or dare anything new. Piles and piles of correspondence exist attempting to defeat the Regional Scheme, but I, personally, at any rate, have received no sort of apology from my critics now that the scheme succeeds. Probably the people who opposed the scheme are too busy turning down some new ideas to bother about the fact that they were wrong to obstruct an old one.

But, of course, the new scheme has its disadvantages — disadvantages perfectly well foreseen, but counted and weighed against advantages. We may divide the disadvantages into two definite classes, and say that on the one hand there are a number of purely local station listeners who cannot get one or other of the programmes or who get them both together and, on the other hand, those who want to reach out for foreign programmes and find two overpowering local stations where only one existed previously.

Taking the former class one sees that they have to face the problem of separating two very strong transmissions, and they are given a frequency difference between these transmissions of 200 solid worth-while kilocycles. Of course, the problem is ridiculously simple really, and one must face the fact that it can be done with very simple apparatus.

### Use a Rejector.

The real question at issue is as to whether the B.B.C. has the right to ask poor people to spend, say, five shillings on their sets in order to make them conform to modern requirements. Such sets are probably three or four years old, and cost when bought or constructed at most a few pounds, at least, a few shillings.

I think quite definitely that it is not asking too much, considering the great benefits that the Regional Scheme should convey to the majority, to ask people, after all this time, to bring their very cheap sets up to date by using such simple adaptations as the "P.W." Brookmans Rejector. (Incidentally, those who tried to turn down the scheme argued that a Rejector would cost two or three pounds.)

I can feel more sympathy, however, for those who find the transmission on 261 metres very much weaker than that on 365. Wave-lengths below 300 metres are unsuitable for broadcasting, but since the bureaucrats, in their wisdom, have allocated these wave-lengths for the broadcasting services, one can do no more than use them and ask that some pressure may be brought to bear so that eventually there may be a more rational distribution of wave-lengths among the claimant services throughout the world.

It is a fact, however, that these shorter waves experience embarrassingly pronounced local shielding effects in large towns. In one place we may find the ratio of strengths of longer to shorter as much as twenty to one in favour of the longer, at others, two to one in favour of the shorter.

### Varying Field Strengths.

Places a few tens of yards apart may represent wholly different field strengths; there is no rationality in behaviour of these higher frequencies. Nevertheless, so far as my admittedly small experience goes, I have never met a true blind spot, nor ever found a position where a cheap but decently designed set could not separate the two adequately, nor where the field strength was so weak as to give noisy background.

While one would wish for better wave-lengths, for all sorts of reasons, so close are Londoners to the powerful 30-kw. station, that while there may be a great disparity in the strengths of the two transmissions, in no case I have met with could the listener be said to be denied service. Looking at the matter a trifle brutally one might say that if people cannot afford to get sets which will get both transmissions they at any rate can get sets which give clear reception of one programme, and that is as much as they had before.

Now let us turn to the disgruntled "reacher out," who up to the opening of the Regional Scheme was able with, say, a three-valve set to get a choice of ten or so medium-wave stations which all faded beautifully. He is now denied the thrill of reaching out, and complains.

But it is not the duty of the B.B.C. to

(*Continued on next page.*)

## TWO-WAVE TELEVISION.

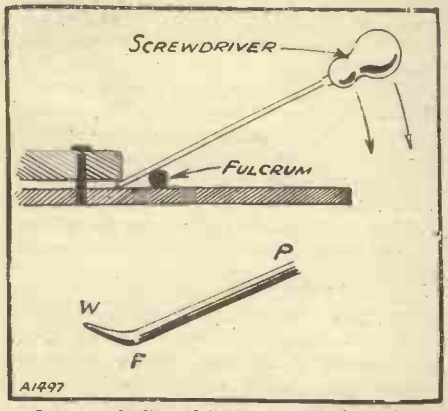
Lord Ampthill (left) and Mr. John Logie Baird listening- and seeing-in during one of the double-wave television tests that followed the inception of double-wave broadcasting from Brookmans Park.

# USING A LEVER.

**Some interesting notes supplementary to "Set Stresses," an article which appeared in our May 3rd issue.**

HERE is an interesting example of lever action. At one time or another you might have wished to remove something nailed to a baseboard or another piece of wood. The unmechanical procedure is to take a screwdriver or some other such tool and dig it into a crevice between the two objects and wrench about until something happens.

## DO IT SCIENTIFICALLY.




Some people dig and tear away at such a job as this, whereas it can be done cleanly and with much less effort if the lever principle is applied as shown.

The job can be done much quicker and much more neatly in this way. The screwdriver is prised between the two objects to secure a firm grip and some hard article forced down underneath the screwdriver and held firmly to act as a fulcrum. Then as the handle of the screwdriver is pressed down the lever principle comes into operation.

### A Homely Example.

A lever does not have to be straight, although it is shown in this form. Some kinds of levers provide their own fulcrum which, after all, is only the point of pivoting. That job could be done with an article shaped as in the lower illustration.

Any door will provide an excellent example of the lever principle. Notice how easily you can open and shut the door by using the conventional knob. Then try shutting the door by pressing it only an inch or two away from its hinges.

# A COMPACT SOLDERING OUTFIT.

By J. R. WHEATLEY.

THE word solder seems to convey to the minds of most amateur constructors the greatest drawback to the successful construction of a receiver. After watching several unsuccessful constructors at work with the soldering iron the conclusion one comes to is not that it is beyond hope to make them experts in the art of soldering, but merely that the methods they employ are wrong, and are militating against the successful completion of the job.

### A Hopeless Muddle

I can picture one constructor I remember seeing at work; he started with his soldering tackle arranged in a workmanlike way on the workbench, but within five minutes he had lost his solder, then the file to clean his iron had mysteriously disappeared, and, lastly, his elbow became embedded in the soldering flux and he gave up soldering for a time.

Some few weeks later I suggested to him that he constructed a small soldering plate on lines similar to those shown in the photograph, and after a little persuasion he said he would.

The result is that he can now concentrate on his soldering, for he no longer worries where the iron cleaner is, or to what remote resting place the solder, or his flux, has disappeared, while the soldering iron is really hot when he starts the actual soldering operation.

The soldering plate consists essentially of a block of thick wood to which are attached three empty blacking tin lids, a large paper clip, and a piece of broken file held in place by four staples. The block can be screwed down to the workbench.

### That Extra Hand

In one of the tin lids all the odd pieces of soldering are placed, and this is used for tinning the iron, or small pieces of solder may be picked up on the iron to make the joint. In another of the tins a block of sal ammoniac is wedged for cleaning the iron, when it only requires a slight rub to remove the oxidisation due to the action of the fire or gas flame on the tinned point. In the third lid the soldering flux is placed.

By placing brass screws through the centre of the tins into the wooden blocks it is possible to remove the tins when necessary and replace them with new ones. You will find that the piece of broken file is invaluable when your iron becomes slightly burnt. Lastly, the paper clip is as good as that extra hand you have so often wished you had.

As a rest for the iron, when not actually in use, a large wood screw should be screwed into the side of the wooden block.

## FOR YOUR WORKSHOP.

Your radio workshop may be nothing more than a corner of the kitchen table, or nothing less than a miniature factory, but whatever its size and present equipment you will find the above gadget most useful.

# REGIONAL SCHEME PROGRESS.

*(Continued from previous page.)*

study the reacher-out. If it were, the logical outcome of such a policy would be to shut down all British stations (and one supposes get into awful trouble with listeners in Spain). However, if the Regional Scheme made it definitely impossible in any circumstances for the Londoner to get any foreign stations one would see that there was some basis on which to build a complaint.

### An Ordinary Three-Valver

The listener would point out that the way he amused himself was nobody's business but his own, that he had spent a lot of money equipping himself with an apparatus to amuse himself with, and now all that money was wasted. Again, in the face of the desires of the inarticulate but great majority, his claim might not be finally considered as valid, but our sympathies might be with him to some large extent.

But with ordinary existing three-valve types of set how has the Regional Scheme affected him? I took a typical three-valver to within a mile of Brookmans Park, and got three foreign stations above Daventry 5 X X in wave-length. I took the same set to the centre of London and got all the good stations above 380 metres. In South London I was quite unembarrassed by Brookmans Park. So that the average Londoner has a fair choice with an ordinary three-valve set.

But what if he likes to set about building a a really selective set? I guarantee to design a set which in any part of the Metropolitan area will pull in stations outside ± 30 kilocycles from either of the Brookmans Park transmitters. To save myself trouble, I could copy an American set with three or four ganged stages, or use a super and a frame.

The Americans have been confronted by far worse problems than Brookmans Park ever set any receiver designer, and they have solved them. Why isn't it done here?

### Plenty of DX

It will be, in fact, but it never would have been if Brookmans Park had not made it necessary. Receiver design follows transmitter technique. So the reacher-out to-day, with a typical set, is not denied all foreign programmes, and he must be thankful to the Sabbatarian policy of the B.B.C., which gives him Sundays with lovely long stretches of free ether stretching out between Church services.

The reacher-out to-morrow must equip himself according to modern needs, and with a suitable set can have nearly all the ether for the asking.

In conclusion, I do not feel that the twin wave-length policy is disastrous even to minorities. What I do feel is that it may be redundant if the two programmes each continue with the sameness of B.B.C. mentality behind them—but that is another story.

# MODERNISING OLD SETS

**Most constructors at one time or another must have faced the problem of choosing between bringing an old set up to date and building a new receiver. Here are some hints on the subject by a noted set designer that will help amateurs towards a solution.**

**By VICTOR KING.**

SOME few weeks ago an acquaintance asked me, "What are the good makes of L.F. transformers?" I told him. I met him again a few days after that and he didn't seem too pleased with himself.

It turned out that he had built himself a three-valve set in the rather earlier days of broadcasting. This outfit had given him excellent service. But, at last, someone pointed out that many of the components were badly out of date in their design.

In particular, the one L.F. transformer, he was told, was hopelessly inefficient and not capable of giving a tithe of the results of one of the really up-to-date L.F. transformers.

### "New Wine in Old Bottles."

So he asked me the question contained in the first paragraph and, in due course, installed one of the makes I recommended.

But instead of improving his results just the reverse happened. The quality of reproduction went all to pieces and there were howls and whistles that he could not stop whatever H.T. and other such adjustments he made.

Indignantly he handed me two L.F. transformers—one was a most primitive assembly of iron and wire, and the other was a glossy modern that seemed to exude efficiency.

"When I put the old one back everything is O.K. That new transformer must be a hopeless 'dud,'" he said.

Actually, as I proved to him later on, it was the old transformer that was the "dud"—the new one was in perfectly good order.

We get so many cases of a similar nature brought before us that, although I have briefly touched upon this subject of new accessories and new components that "ruin" old sets before, I feel quite justified in amplifying it a little now that "P.W." readers number a respectable proportion of a million.

### Too Effective!

It is not difficult to understand what happened when that new transformer tried to do its bit in that old receiver. It was too effective; the amplification of the L.F. stage in which it figured went up and the other parts of the outfit couldn't cope.

No doubt the following valve was quite unable to handle the new input. Serious overloading occurred.

A further effect was the development of L.F. instability. This caused those squeaks and howls. Those old sets are not designed to provide stable operation with high magnification.

As a matter of fact their stability, which is a source of pride to some of their reactionary owners, is a snare and a delusion. It isn't really stability at all as we now interpret the condition. It is merely the "puddenness" of inefficiency, the antithesis of real stability.

A modern set that can truly be described as stable will give you, if needed, enormous magnification per valve without the slightest tendency to "spill over."

The same sort of thing that happened to my transformer acquaintance can happen to those who replace old valves for new.

Modern valves give much greater effective amplification than valves of three or four years ago. That is generally speaking and type for type.

Supposing an old "first L.F." valve were replaced by one of those now available. The amplification factor for a similar impedance would be higher, and its output would, perhaps, be double or even triple that of its predecessor.

If it so happened that the following valve could before only just cope, it is obvious that in the new conditions it would be badly overloaded.

Also it might quite likely happen that the H.T. current would be greater with the new valve if it were operated at its correct H.T. voltage. This could quite conceivably cause core saturation in an L.F. transformer of not-too-new design.

This would further smash up the quality of reproduction.

### Should Be Rebuilt.

The point to remember is that modern sets are designed for modern components and modern accessories, just as those old sets were designed for the parts and incidentals that were then available.

I am not much in favour of the retention of one radio set for a long period—like cars they must inevitably fall behind the times. And haphazard modernisation of 1923 and 1924 vintages does not appeal to me.

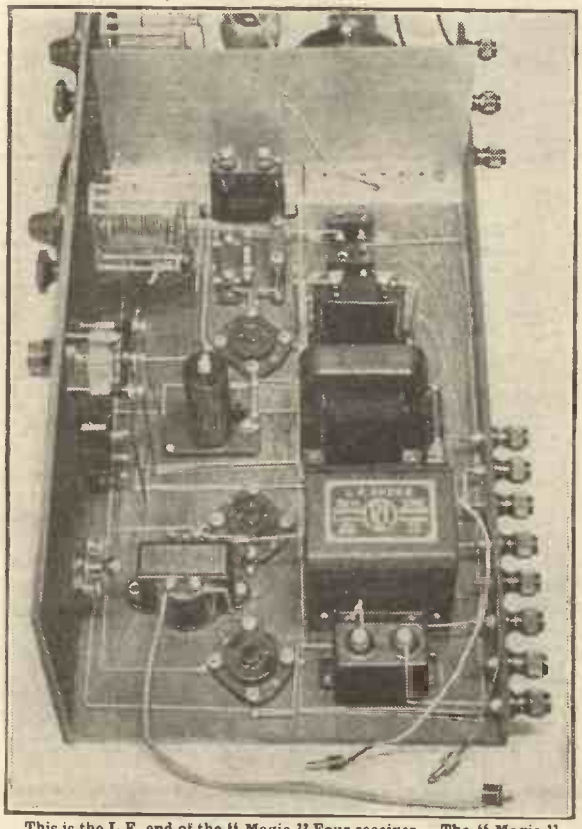
Complete rebuilding, yes, but this is a job only for the very experienced constructor.

I think constructors must expect to face a certain small cost in depreciation, such as is found in most other things.

Sets like the "Magic" Three will remain "current" for a greater length of time than sets produced in the earlier years of broadcasting. And I think such a set will be more amenable to simple modernising in the years to come, as the "Magic," at least, is designed on scientific lines, and has ample "margins."

But those early sets really should be scrapped, for there will not be much stuff in them deserving a place in a modern outfit.

## MODERN "MAGIC"



This is the L.F. end of the "Magic" Four receiver. The "Magic" Four will no doubt hold its own against all-comers for a very long time.

## REMEMBER THAT. . .

**Lead-covered cable should not be used for aerial leads.**

* * *

**One of the most important points in the care of an accumulator is to obey the manufacturers instructions regarding the rate of charge and discharge.**

LATEST BROADCASTING NEWS.

# B.B.C. UNPOPULARITY.

## WEDGWOOD CELEBRATIONS —WELSH CHILDREN'S PEACE MESSAGE—"TURNING THE TABLES"—HERE AND THERE IN THE PROGRAMMES.

THERE has been an alarming increase lately in the unpopularity of the B.B.C. This is mainly due to the relentless pursuit of centralisation in the face of overwhelming public opposition in the Provinces. The demand for a Parliamentary inquiry into the working of the B.B.C. is rapidly gaining ground, and is accelerated by the persistent rumours of grave dislocation at Savoy Hill.

Meanwhile, there has been one important change in the organisation of the Programme Department. Mr. A. R. Eckersley has handed over the administration to Captain Cecil Graves, Viscount Grey's nephew. But it is not expected that this change will have any policy reactions such as followed the handing over by Arthur Burrows and Cecil Lewis.

It will be a blow to the enemies of centralisation to know that Captain Graves is an even more ardent advocate of it than Mr. Eckersley. It is also understood that the Board of Governors is similarly pledged to fight public opinion about centralisation.

### Wedgwood Celebrations.

Several important relays will be heard by Northern listeners in connection with the forthcoming celebrations of the bi-centenary of the birth of Josiah Wedgwood, the most famous of all English pottery manufacturers. The celebrations will occupy a whole week, beginning on Sunday, May 18th, on which day a special bi-centenary service will be relayed from Stoke-on-Trent Parish Church.

On Tuesday evening, May 20th, listeners will hear a chronicle play of the life of Josiah Wedgwood, specially written by Edwin Lewis, and also a talk the same evening by Mr. H. W. Maxwell on "Pre-Wedgwood Potters in Staffordshire." Arrangements have also been made to broadcast the speeches from a luncheon at the Town Hall, Stoke-on-Trent, when Sir Oliver Lodge, himself a native of Staffordshire, is expected to be present.

The actual date of this luncheon has not yet been decided, but it will most likely take place on Industrial Day, Thursday, May 22nd.

### Welsh Children's Peace Message.

For the ninth year in succession the Welsh Children's World Wireless Message will be broadcast from West Regional Stations on the afternoon of Goodwill Day, Sunday, May 18th. It will be given by the Rev. Gwilym Davies, Vice-President of the Wireless League of Nations Union.

Goodwill Day is now celebrated in practically every country throughout the world and messages are exchanged between the children of one country and another. Last year the Welsh children received no fewer than fifty replies from different countries, including one in Welsh from children in Hobart, Tasmania.

Two years ago the B.B.C. put out the message from Daventry 5 X X as well as from Cardiff, and there was an even greater response. Last year and this year, however, Savoy Hill would not include the long-wave station. There have been Parliamentary deputations, several petitions, and all kinds of forms of pressure brought to bear. Mr. Lloyd George himself is believed to have intervened, but the B.B.C. was adamant.

It is suggested in Wales that militarist tendencies are responsible; but not much credence is given to this rumour in better-informed circles.

### "Turning the Tables."

Edith James, Mary Pollock, Edgar Lane, Alfred Butler, Eddie Robinson, Harry Sennett, Charles Herbert, Aerbut and Gaertie, and Jack Venables and Philip Brown's Dominoes Dance Band will take part in another light feature programme, entitled "Turning the Tables," arranged for listeners to the Midland and London Regional transmitter on Saturday, May 24th. The book and lyrics are by Graham Squires, and Charles Brewer who has been responsible for writing and producing many similar programmes, now blossoms out as a writer of incidental music.

### Here and There in the Programmes.

An address by the Archbishop of Canterbury will be relayed from Southwark Cathedral for broadcast throughout the country on Sunday, May 25th.

* * *

Speeches by some of the British and Overseas delegates at the Imperial Press Conference Dinner, which is to take place at the Guildhall, London, on Monday, June 2nd, will be heard by listeners to the National programme.

* * *

The Midland Regional programme on Sunday, May 18th, will include incidental music to Macbeth, specially composed by Sir Granville Bantock for Lewis Casson and Sybil Thorndike's production of Shakespeare's tragedy. The score is entirely for wind instruments.

* * *

A particularly interesting relay has been arranged for listeners to the National programme on Tuesday, May 20th, when the Samuel Pepys Commemmoration Service will be heard at St. Olave's Church in the City of London. The service includes the unveiling of a wreath by the Lord Mayor of London, and a special address entitled, "Pepys as a Friend," given by Dr. J. R. Tanner.

* * *

For several weeks during the latter part of May and June a series of talks, arranged with the object of consolidating still further the friendly relations between England and America, will be included in the broadcast programmes of stations "hooked up" with the National transmitter. The series, which is entitled "Stars and Stripes," is intended to give British listeners topical views about the United States, and the talks will include several relays from the other side of the Atlantic.

## "DOG TIRED"?

They tried to make him bark at the "mike," but without much success, for he is the exclusive and aristocratic Champion, Sirdar of Ghanzi.

# FOR THE LISTENER.

**A Specially Contributed Criticism of Current Broadcasting Events. By "PHILEMON."**

**Who will long be remembered for those wise and witty broadcasts entitled "From My Window."**

### The Cup Final.

A GREAT match, apparently, and a great broadcast by Mr. Allison who, as one of the Directors of the Arsenal Club, must have been very excited about it. Even in the most gasping moments we missed nothing, his voice remained clear.

He won't be sorry that the season is over; but thousands of us are very grateful for the pleasure he has given us. Au revoir!

### Siamese Twins.

Lady Tree was in command at the children's hour. She told a good story about a Siamese Prince who started the family Bible with twins, whom he called Day and Night. In due course, twins again! So he cancelled the first names, and called the four Spring, Summer, Autumn and Winter.

Triplets on the next occasion did not put the resourceful fellow out; he changed the names once more, and called them Monday, Tuesday—and so on. I think, after that, he had to fall back on the months of the year!

### Road Sense.

I am perpetually astonished by the daily list of road accidents. Shall we never learn? The Earl of Cottenham drummed the lesson into us again. Concentration, Deliberation, and Pride in driving—well, such was his formula for drivers.

My barber that morning had given me his view on the matter. "Hesitation is the trouble," he said. Certainly he himself made no hesitation in the matter of the pimple that confronted him on the bend of my chin. It must have been a pedestrian. It had no chance.

(*Continued on page* 248.)

# IN THE EARLY DAYS

## by KATE WINTER

**A very well-known singer relates some of her early broadcasting experiences, and has a word or two to say about present-day studio conditions.**

TO me, the position that the British Broadcasting Corporation holds to-day is a source of perpetual amazement. In this Year of Grace it stands as one of the greatest wireless powers in the world, and yet a brief eight years ago listeners numbered but a few thousands instead of several millions.

In 1922, the B.B.C. had only four stations, including one used for experimental purposes at Writtle, Essex, and their headquarters at Marconi House consisted, I believe, of only two rooms, a small office and a studio.

### Strenuous Times.

All the work of the place seemed to be done by four or five people at the most—although there may have been many others whom I never saw. Still, programmes were broadcast for five or six hours daily, from five o'clock until half-past ten, or thereabouts. Only the frequent intermissions, and such admonitions to listeners as "Stand by for fifteen minutes, please," revealed the true state of affairs at the transmitting end.

With many of those early pioneers, the memories of those early days are probably dim and shadowy. I find this is the case myself. Although I was one of the first singers to broadcast, it is difficult to remember the general conditions as they really were. Yet some of my impressions of those far-off times are still remarkably vivid.

How well I recall my first audition, for example. When I first heard of this wonderful invention, it struck me that my voice might be suited to the requirements of the microphone, or that device might be suited to me, so I wrote to Marconi House, asking if they would give me an audition. There came in reply a letter telling me to call and undergo a test.

### My First Audition.

It was with the utmost nervousness that I obeyed, and duly presented myself at the studio. No waiting-room then. One just walked in, stared for a moment at the drab office wallpaper—or was it paint?—and at the settee, and then one faced the microphone, whilst perhaps a dozen other would-be broadcast artistes packed themselves away in a corner to await their turn. Imagine my relief when I found the ordeal over, and when I learnt that I was satisfactory.

My first actual broadcast took place under similar conditions, and was even worse to me than the audition, but it was not long before the informal atmosphere of the studio made me thoroughly at ease. I soon felt that I had been broadcasting for years.

At that time nothing was cut and dried. We were groping on the threshold of a new era, and although it was most enjoyable to me I am afraid that some of those pleasant people with whom I associated had to work terribly hard.

A recent photographic portrait of Miss Kate Winter.

There was one gentleman in particular who seemed to me to do almost everything. He acted as announcer, accompanist, engineer, and I believe that he even held the auditions and conducted most of the correspondence.

Although we had happy times in the early days, I much prefer the well-ordered routine of the studio work of to-day. Of course, I miss the visible audience, and can never quite get accustomed to the depressing feeling of leaving the microphone and going quietly home, wondering if my songs have been heard and enjoyed.

### The Children's Hour.

And now you will understand why encouragement and appreciation mean so much to an artiste. Even one letter from a kindly listener makes a world of difference. To-day, only the Children's Hour preserves that former informal atmosphere to remind one of the B.B.C. of other days. That is why I always enjoy appearing in this "Hour."

There is only one other fad of mine, and it is that I always make a point of being at the studio earlier than is necessary. This is because I am a nervous creature, and realise that the main reasons for trepidation on the part of an artiste are forgotten words, lost music, or hustle.

I take special care to avoid all these things by being ready at least half an hour before the broadcast is timed to begin, so that when I do face the microphone I am perfectly sure of myself and absolutely calm.

This carefulness is probably the reason why I have never had any of those escapades of which other artistes sometimes tell. Only once have I had a strange experience, and this was no fault of mine, nor was it due to a slip on the part of anyone.

### A Peculiar Experience.

Readers will probably remember the model studio which formed one of the leading features of the Radio Exhibition at Olympia two or three years ago. Well, I was one of the people who made a broadcast from it, and my sensations were peculiar in the extreme.

Although the cabinet was exactly like an ordinary studio, save for one glass window on the side through which the public were allowed to peep, one had the impression of being on show in a glass case in a soundless world.

Naturally the padding of the studio prevented noises penetrating from the outside, and so, although I could see the continual stream of people peering in at me and speaking one to another, I could not hear a thing. The onlookers just floated by in perfect silence.

# SIR JOHN REITH AND THE TALKS.

**Talks have come in for more criticism than any other type of item which is broadcast, so all readers will be interested in our recipe for "really popular talks."**

**By THE EDITOR.**

NO doubt many of our readers listened the other evening to Sir John Reith's talk on "Talks."

Without exactly coming under the classification of an *apologia*, the text of Sir John's broadcast had something of an explanatory character. It is interesting to note that Sir John considers the Talks need explaining.

"Of course," said Sir John, "there is always some criticism about the Talks, perhaps more than about any part of our work."

There is. There is also an old saying: "There's never smoke without fire."

"There are still, I think, some people who say that there should not be any Talks at all," went on Sir John; and he added: "There are certainly some who say that broadcasting should not be used for anything that looks like 'Education.'"

### An Unhappy Word.

There may be; but there are many, many people who hold the opinion—as we do—that the *idea* of Talks is good, but the psychology and choosing and presenting of them is not so good as it should be.

We agree with Sir John that "education" is an unhappy word, and "adult education" still more unhappy. In that case, why use them?

Sir John wishes someone would invent another word to describe the sort of education which makes life so much more interesting and enjoyable than it otherwise would be. But the invention of another word is surely unnecessary. A new word won't alter the policy of the Talks. "What's in a name?"

No; the substitution of another word for "education" is no remedy. A fundamental change of conception is necessary if—as we remarked in a recent article in the B.B.C.'s publication, "The Listener"—talks are to become "progressively palatable for the multitude."

Sir John says there is no positive desire on the part of anybody (at Savoy Hill) to "educate" listeners in the patronising and narrow sense of the term. We accept Sir John's assurance—but maintain that the atmosphere of patronage is associated with some of the Talks because of the very titles used and the methods of presentation employed.

### Excellent "Intention,"

The intention may be excellent, and the Talks Department at Savoy Hill genuinely free from the desire to "patronise," but, nevertheless, there is a good deal of public resentment—and Sir John cannot be unaware of it—because of the nature of the Talks.

The trouble is, partly, we think, faulty technique. Some B.B.C. lecturers simply cannot rid themselves of the lecture-room style. Both in the composition of the text of certain talks, and in methods of presentation and delivery—they are pedantic, wearisome, and often exasperatingly dull.

Sir John says: "No one disputes that the main function of broadcasting is to entertain, but if we were only to 'entertain,' and if the word were to be used in its narrow sense, it would be quite impossible to fill up all the hours of transmission agreeably."

### Those "Words"!

But why interpret the word "entertain" in its narrow sense? Words! First "education," then "entertain." Does Sir John consider the word "entertain" only in its relation to actual *amusement?* And does he believe, in that case, that something amusing cannot, at the same time, be "educational?"

## B.B.C.'s NEW MUSICAL DIRECTOR.

Dr. Adrian C. Boult, on the right of this picture, is the new musical director of the B.B.C. He is here seen receiving a handsome desk, presented to him after his last appearance as the conductor of the City of Birmingham Orchestra.

Since we are splitting hairs over words, let's introduce the word "interesting" into this controversy—for controversy it is. "Entertainment pure and simple simply grows tame," says Sir John. Surely this can only mean that the entertainment he has in mind is of itself unintelligent; and surely, again, this is a tacit admission that entertainment "pure and simple" broadcast by the B.B.C. is so "pure" (in the classic sense of the word) and so "simple," that it becomes progressively duller and duller, and consequently more and more unintelligent?

If so, that explains a lot; and we suggest that "entertainment, pure and simple," is a poor recipe, just as "education," pure and simple, is equally poor. Why not combine the two? The recipe becomes quite a different proposition. We then have something which is instructive, with an entertainment value. It only wants a third ingredient—interest value, and the recipe for the *subject* of a Talk is complete. Remember, a thing may be educative and it may have entertainment value—but it may not necessarily be interesting as a whole.

To paraphrase Mrs. Beeton: "Take ten parts of subject matter which will teach listeners something of value, sprinkle it with ten parts of entertainment to make it palatable, and mix with ten parts of interest to aid digestion." Voila!

### Microphone Presentation.

After that comes the question of microphone presentation: voice, manner, general "appeal" of the speaker. But that is another story.

With the latter half of Sir John's talk we found ourselves more in sympathy, especially when he pointed out that: "The great expert is brought to the listener's home, that he comes as a very human, understandable and understanding individual. It is not because he likes talking for talking's sake; it is certainly not because of any fee he gets.

"He takes, I can assure you," said Sir John, "endless trouble in the selection and preparation of his material. . . . He does so because he is so interested in his subject, because he feels sure that thousands of people are ready to be interested in it, too, and because, for their own sake, he wishes them to share some of his knowledge and feel some of his enthusiasm."

We feel perfectly sure that when the "great expert" is brought to the listener's home (via broadcasting, he really believes himself to be a very human, understandable and understanding individual. But believing oneself to be something, and actually being it is another matter.

### Thankless Task.

And that is why it does seem a thankless and rather cruel task criticising some of the estimable people who broadcast these Talks, for they really think they are understandable and understanding. And there is no doubt that they love knowledge for its own sake and genuinely wish to impart it. And, equally, there is no doubt that thousands and thousands of people in this country find them satisfactory, just as hundreds of thousands find them unsatisfactory because, although they have knowledge to impart which the average listener welcomes, they present it in a way which, to put it frankly, makes it uninteresting and often tedious.

Sir John says these experts do not like talking for talking's sake; but some of them certainly give the impression of liking talking for talking's sake, and that is a fatal drawback to a successful broadcast. It is perfectly true, as Sir John points out, that the great expert can have no ulterior motive, but we think it is exaggerating a little to

(Continued on page 248.)

# Stopping Pick-up Scratch

**Are you troubled with needle scratch when you use your pick-up? If so, the hints in this article may be of assistance.**

**By K. D. ROGERS.**

PICK-UP scratch is the name usually given to the hissing sound one gets when using a pick-up, and is due to the friction of the needle against the record. One gets the same sound when using an ordinary gramophone, but somehow or other it seems to be more out of place when a pick-up is being employed than when a sound-box is in use.

Unfortunately it is not an easy thing to cut out, for to eliminate the scratch altogether usually means that a loss in brilliance occurs, some of the high notes losing their quality.

As you know, to reproduce music properly one must reproduce the notes in their proper proportions, and with their proper harmonics. Now the piano range only goes up to somewhere about 3,000 cycles as regards fundamentals, but above this there is the whole range of harmonics, and also clarinet notes, violin notes and those of other very high instruments, and, in fact, to reproduce properly the whole of the orchestra one would really have to go to about 10,000 cycles. This, unfortunately, is impossible, both in broadcasting and in the record, in the present states of the arts.

### Limited Frequency Band.

Broadcasting is limited because of the space available in the ether, and the gramophone is limited because of the mechanical difficulties of forming grooves that would give a range of 10,000 cycles. As a matter of fact, in the record very little is recorded above 5,000, and notes above 3,000 are not recorded in their proper values, getting weaker and weaker as we go up the scale.

We find that we can get really good reproduction not easily distinguishable from the real thing, by reproducing up to about 6,000 cycles. Unfortunately, however, in the pick-up system, which will produce well up to that figure, we get this trouble of scratch, which will accompany the reproduction of notes of anything of about 3,500 upwards, due to the composition of the record. Wherever there is friction there is scratch, and the more abrasive a record is, the more scratch there will be. It seems rather a hopeless business, doesn't it?

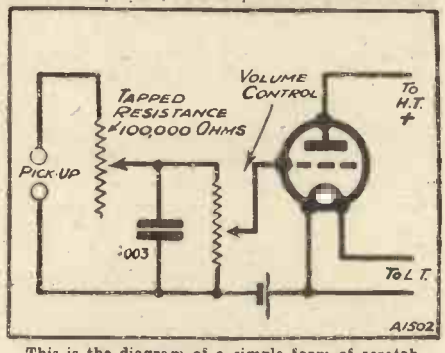
Now the cutting out of scratch is obviously the elimination of those frequencies which cause the scratch noise, and therefore the elimination of any other frequencies which give a note roundabout that particular band. Unfortunately, scratch does not seem to have any particular frequency, so that in order to get rid of it one has to get rid of, (or to reduce greatly) all frequencies round about 3,500-4,500 cycles.

This can be done by means of a system of chokes and condensers or a system of resistances and condensers, or by condensers alone. It is worth while trying a condenser across the grid and filament of your first valve, say a value of ·001 mfd. or a little larger. This may help things a little, especially if you have a volume control as well.

### Filters Often Spoil Reproduction.

I am not very fond of scratch filters myself, because I think they play havoc with the brilliance of the reproduction. The accompanying diagram shows one system of scratch reducer which you might like to try, but I prefer to forget all about scratch filters and "grin and bear it" rather than "deaden" the reproduction.

## A SIMPLE SCRATCH-FILTER.




This is the diagram of a simple form of scratch reducer. The drawback to all such devices is, however, that certain of the brilliance of reproduction is lost as well as the scratch.

Such pick-ups as the Lissen, B.T.H., the Woodroffe, the Magnum, to mention a few, are not prone to scratch troubles, especially if one has a loud speaker which is not peaky in the higher register.

Of course, if you have a loud speaker which is inclined to over-emphasise the treble to the detriment of the bass, then I am afraid that your scratch troubles will be more than usually accentuated. Similarly, if you have an amplifier which will reproduce the treble and forget about the bass, your scratch troubles are likely to be increased.

An all-round amplifier which gives good quality on radio, and quite a good amount of bass, and a speaker which does the same is not likely to give you half so much trouble from scratch as the type of amplifier and speaker I have just mentioned.

A variable capacity control placed across the secondary of a transformer, the primary of which is connected to the pick-up, is also very useful in cutting down the high notes and therefore the scratch. I am afraid that you will not be able to *eliminate* scratch without badly decreasing your high notes, but it is worth while trying the simple schemes outlined here.

### Different Needles.

Those of my readers who want further details concerning pick-up work should read the Radio-Gramophone Supplement in "Modern Wireless" each month.

It is remarkable what a different needle will sometimes do. For instance, I find that spearpoint needles are less prone to produce scratch than the ordinary type of steel needle or the Tungstyle variety.

Another needle which is quite good and which is not prone to emphasise the scratch is the Waltone graphite needle. Fibre needles can be used in some pick-ups.

A little experimenting in buying various records may help readers who are troubled with scratch, but I am afraid that they cannot have it both ways. If scratch is very much accentuated, and it really worries you, then it is more likely to be trouble with your pick-up than anything else, and it is a sign that the pick-up should be changed for another make. A small bit of scratch in the background in speech records and vocal solos must, I am afraid, be endured if good quality is to be obtained.

# RAIN AND RADIO

**Wireless is greatly affected by the weather, as "P.W." readers have probably noticed, and in this interesting contribution some of the curious phenomena underlying these effects are described.**

**By G. H. DALY.**

DURING the South African War—the first time that wireless was ever used in warfare, by the way—it was noticed that signals were very much better after a shower of rain had fallen on the veldt.

In the case of the veldt, the reason why the signals were better after the rain than before was because dry ground tends to absorb wireless waves and they are quickly damped out, whereas when the ground is covered with a layer of moisture this has the effect of preventing the waves from sinking into the ground and they will last longer.

### In Wet Weather.

This after-rain effect is more noticeable in the day-time, when the ground wave only is received. At night, when reception is accomplished mainly by reflected or refracted waves from the Heaviside Layers, this effect is not so obvious.

Other factors, of course, enter into this phenomenon. For example, a beneficial effect should not be so noticeable immediately after rainfall, because the aerial insulators at the transmitting and receiving stations are usually wet and, therefore, are not up to their usual efficiency. This is because water is a conductor, so that the high-frequency currents in both aerials will tend to leak away to earth over the wet insulators.

When, however, a wind has dried the wet insulators, and the rain is still lying on the ground, then reception should be and usually is above normal.

In the case of reception during falling rain, conditions are different. The aerial insulators are usually wet, and consequently there is a definite loss of energy over the wet insulators. More energy is, of course, lost in the high potential aerial of the transmitter than at the receiving end, and this loss we may say will largely counterbalance any benefit gained by the passage of the waves over the wet earth.

### Rain Reflections.

There is also the fact that when the rain is falling, a certain amount of energy is conveyed from the aerial to the ground by the conducting rain. In other words, the insulating properties of the aerial are still further reduced, and more high-frequency energy passes directly to earth without going through the receiver.

Precisely what happens to wireless waves when they pass through a rainstorm is not definitely known. In the usual way they appear to be unaffected to any appreciable extent, yet theoretically they should be reflected by the rain slightly, somewhat in the same way as the reflecting wires of a beam station reflect wireless waves in one particular direction.

This reflection must occur to a slight extent, but as far as is known has not been remarked upon in practical working.

### Absorption Effects.

Anyone on the edge of a rainstorm might expect, however, to experience a slight increase in signal strength due to reflection, provided the oncoming waves are arriving from a suitable direction; whereas a receiving station within the area of the rainstorm may experience a slight falling off in strength from this reflection. We may also expect the rain to absorb a certain amount of the wireless energy from the ether on the same principle that trees absorb wireless waves by acting as aerials.

Then, of course, the type of rain has a great deal to do with its effect on radio. In some parts of the world wireless reception is impossible when it rains, owing to a continuous hiss issuing from the 'phones or loudspeaker. This is due to the electrified rain energising the aerial.

### Charged Clouds.

Rain is not the simple drop of water we used to think it was. Not so long ago rain was explained as being due to the condensation of the air by cooling, when water was formed and it rained.

Within the last few years, however, we have learnt that the raindrop is a very complicated unit indeed, intimately connected with atmospheric electricity and electrified dust. Every raindrop has a material centre which is in many cases electrically charged.

This centre is in fact an ion, and this ion it may be added is due to the gas called radium-emanation, which is given off by the radio-active substances in the earth. The gas spreads through the atmosphere and breaks up the molecules of air with which it collides, so forming electrically-charged particles which we call ions.

Thus falling rain may be, and often is, a widespread descent of atmospheric electricity, and it has been found that the electrical charge on some raindrops is greater than the force of gravity; so that a rainstorm is an electrical force to be reckoned with by anything passing through the air such as wireless waves.

After a shower of this kind of rain, the atmosphere has been cleared of much of its electricity, the rain has brought the ions to earth, as it were, so that we might expect the insulating properties of the air to be more efficient, therefore clear and crisp reception is likely. Speaking tentatively this may account for the clear reception sometimes noticed after a storm, as if the air had been cleaned up.

### Around An Aerial.

On the other hand, during such a rainstorm, we may expect a slight background of "atmosphere," a slight hiss or noisiness which muffles reception slightly. This is due to the electrical charges in the raindrops energising the aerial.

So far we have only touched the fringe of the effect of weather on wireless and vice versa—Professor Houllevigue, of Paris, claims to have proved, for instance, that the mist surrounding a transmitting aerial is dispersed when the station is radiating. There is ample scope for research in these directions by amateurs, as it is largely a matter of observation with an ordinary receiver.

## AFTER THE STORM.

A shower of rain seems to clear the air of vagrant electrical charges, and clean and crisp reception generally results.

## RADIO NOTES AND JOTTINGS.

**A good stain for darkening baseboards may be made from a solution of permanganate of potash.**

* * *

**If a cabinet has been scratched badly so as to reveal the white wood, careful treatment with a solution of permanganate of potash, will often restore the colour, and enable the scratch to be hidden.**

* * *

**It is a good rule never to discharge an accumulator at a rate of more than one-tenth of its actual ampere hour capacity. (A twenty actual hour accumulator should not be called upon for more than two amps., etc.)**

* * *

**Owing to evaporation the level of the liquid in an accumulator falls in time, but it should not be allowed to go lower than a quarter of an inch above the top of the plates, when loss should be made good by adding a little distilled water.**

# "DX" LISTENING

**A recent article in "P.W." on station searching proved so popular that we are sure readers will welcome this further, more detailed article on the same fascinating subject.**

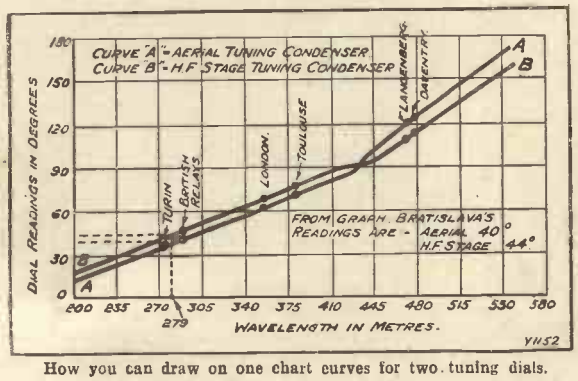
**By N. H. BLUNDELL.**

SOME years ago one had to wait for definite "seasons" to obtain good "D X," but nowadays modern broadcasting enables anybody with a valve set and a decent aerial and earth to receive some foreign stations, at any time if only on 'phones.

In this article, it is proposed to go fully into the calibration of receivers (very necessary for complete success), and the identification of stations and also to give a few hints on getting the best out of your set.

First of all to give two methods for the calibration of sets. The first method is only suitable for sets which employ square-law tuning condensers, the second will suit all receivers.

## LOCATING YOUR STATIONS.




How you can draw on one chart curves for two tuning dials.

Tune in the local station, and note down the dial reading; if there are two tuning dials (besides the reaction control) take readings for each one and make separate calculations for them. If there are three or more, take readings for each in the same way.

### Metres per Degree.

Next tune in to some other strong, known station, and note its reading. Now subtract the smaller of the two wave-lengths from the larger and do the same with the dial readings.

Divide the result of the first subtraction by the result of the second and the final result gives a rough approximation of the number of metres to one degree on the dial. This will not hold for condensers of the straight-line-frequency or capacity type.

If you want to receive a certain station you can now roughly calculate its dial reading as follows. Find the wave-lengths of the wanted station and the local and subtract the smaller from the larger and divide by the result of the previous calculation.

This gives you the difference between the dial readings of the wanted station and the local. If the wanted station's wave-length is larger than that of the local add the difference to the local's dial reading; if smaller subtract.

### A Practical Example.

Here is an actual example taken from my set. The London Regional comes in at 67 degrees, and the Midland Regional is received at 117 degrees.

Subtraction of wave-lengths $479 - 356 = 123$ metres.

Subtraction of dial readings $117 - 67 = 50$ degrees.

Divide 123 by 50 = roughly $2\frac{1}{2}$ metres to 1 degree.

Now if Frankfurt is the wanted station, both his wave-length and that of London are found, and the smaller subtracted from the larger.

The answer is then divided by $2\frac{1}{2}$, and, since Frankfurt's wave-length is larger than London's, the result is added to London's dial reading. If it had been smaller the result would have to be subtracted.

Subtraction of wave-lengths $390 - 356 = 34$.

Division: $34 \div 2\frac{1}{2} = 14$ (approximately).

Addition: $67 + 14 = 81$ degrees.

Frankfurt ought to be found on 81 degrees. Actually he is received at 80 degrees.

However, one degree out does not make much difference when considering only powerful stations for, by moving the condenser a little the wanted station will soon be found.

For accurate calibration a graph is very useful. To plot a calibration curve note down the dial readings (all tuning dials) of as many known stations as possible. If you are fairly near the local, say, 10 miles from a main station or 3 from a relay, it will usually be very hard to get his reading accurately, so it will be best to leave it out.

If you have not previously identified any other stations except the local and maybe 5XX you will probably ask "What am I to do under these circumstances?" This is not an insurmountable difficulty, however, for you can easily identify Turin, Toulouse, Langenburg, and the British relays on 288·5 metres. The way to do this will be given later.

Now take a piece of graph paper, and along the bottom mark off wave-lengths from 200 to 580 metres. Along the left-hand edge mark off degrees from 0 to 180 (or 0 to 100, depending on the scales marked on the dials).

Now plot off the identified stations. This is very simple; in the case of Turin, find the vertical line along the bottom which corresponds to 274 metres (the wave-length of Turin when the chart shown was made), and, at the left-hand edge find the line corresponding to the reading you have noted for this station.

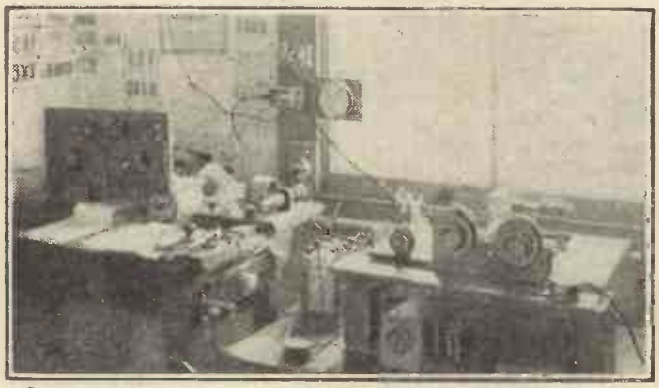
### Plotting the Graph.

Follow these two lines along and make a dot with a pen where they intersect. After you have done the same for the other stations join up the dots so that the line so formed is a gentle curve with no humps. The readings of all dials should be plotted on the same graph, and there should be a separate curve for each dial.

Having done this, if you want to find the reading for, say, Bratislava, look along the bottom of the graph until you come to the line which corresponds to Bratislava's wave-length, i.e. 279 metres, and follow it upwards until it cuts the curves Draw lines (or imagine them drawn) from the points of intersection parallel to the bottom of the paper to cut the left-hand scale you can then read off the settings for each dial.

*(Continued on next page.)*

## AN ACTIVE SHORT-WAVER.



Some of the gear used by "P.W.'s" short-wave expert W.L.S., whose weekly notes have been a popular feature in "P.W." for several years. W.L.S. is very well known in short-wave circles, and he regularly exchanges signals with amateurs all over the world

## "D·X" LISTENING.

(Continued from previous page.)

As more and more stations are identified, the graph can be corrected by putting in the readings for these stations and making the curve pass through the dots. Do not be alarmed if your graph falls off sharply at the ends, or gradually curves, or has a little hump in it.

The falling off at the ends is due to the condensers, and a hump may be caused by interaction between the coils and choke or some equally obscure fault.

### Identifying Stations by their Calls.

If some stations are only a little off the graph line do not trouble to alter the curve to pass through them, as it must not be forgotten that the wave-lengths of stations vary from day to day, as is clearly shown by the frequency charts compiled each month by the Brussels checking station of the Union Internationale de Radiophonie.

Now for the identification of stations. When compiling the data for the graph you can find the dial readings of Turin, Toulouse, etc., by listening on approximately the right part of the dial and identifying them with the following details.

Turin can be recognised by its interval signal of the singing of a nightingale, followed by the announcement (phonetically) "Ehyar Raldio Torino," and by the distinctive Italian language which is soft and keeps an even pitch throughout.

Toulouse is usually loud, and the quality of his transmission is on a par with that of our own stations. He can be recognised by a large bell tolled during the intervals and also by his wonderful announcer who rolls his "r's" and clearly and comparatively slowly enunciates "Ici Radio Toulouse," drawing out the "lou" and pronouncing the final "e" almost as "en."

Langenburg will probably be too near Daventry for some people, but a decent set should be able to separate these two stations, and he is recognisable by his guttural German and his announcement "Hier ist der Westdeutscher Rundfunk," and by a carillon played during the intervals.

The British relays on 288·5 metres will easily be recognised by the burbling sound, although a programme may not be discernible; but if one is it will usually be the National. You will probably find another burbling sound just below; if so this is made by the relays on the common band of 283 metres.

From these details the graph can be made up, but as there are many powerful stations not included in these few, others will be given now. Munich and its relays Nurnberg and Kaiserslautern are often received in this country, and can be recognised by a five-finger exercise played on tubular bells during the intervals and followed by a blast on a hooter.

As soon as the sound of the latter has died down the announcer says: "Hier Deutscherstunde im Bayern-Munchen, Nurnberg, Augsberg und Kaiserslautern.

### The Use of Metronomes.

Berlin's interval signal is a fairly quickly beating metronome, followed by the announcement "Berlin" pronounced "Bear-leen." His programme is sometimes heard on 283 m, in which case it is being heard through either Stettin, Magdeburg or the Berlin relay, or from two or even all three of these stations at the same time.

Katowice announces himself as "Polski Radio Katovicer," but if relaying Warsaw, as he frequently does, the call "Polski Radio Varschara" is given. Here, too, a metronome is used during the longer intervals.

## HAVE YOU HEARD THEM?

Some of the children who are on the permanent staff of the biggest Berlin broadcaster, Zeesen. The kiddies actively assist in the children's hours. The little boy here shown is actually broadcasting a fairy tale.

The calls of most of the other stations are more or less straightforward, but a list of interval signals may prove useful. Milan has a signal something like the Greenwich time signal, but the "pip" is not so clear cut and is more musical; it occurs at intervals of seven seconds. Budapest uses a musical box, which plays a simple but rather charming tune. Ljubljana and Cracow have the unusual signal of a cuckoo "in full blast."

### A Question of Pronunciation.

Besides those mentioned previously the following use metronomes—Vienna, Rabat, Radio Vitus (Paris), Belgrade (deep toned), Frankfurt and Breslau.

However, it should be remembered that the native names of towns are often different from the English versions. So a list of the more common ones is given.

Vienna is Wien (pronounced Veen).

Prague is Praha (pronounced as written).

Copenhagen is Köbenhaven (pronounced Ker-pen-hauntz).

Belgrade is Beograd (pronounced Bay-o-grad).

Posen is Poznan (pronounced as spelt).

Genoa is Genova (pronounced as spelt).

Finally there are Berne and Luxembourg. The former, being in French Switzerland, is pronounced Bairn and the latter is announced in both German and French. The French version is easier to understand, and the accent is on the last syllable, the first two being rather hurried.

Identification of stations by wave-length is not complete in itself, and should never be taken as irrefutably establishing the situation of a station. The only satisfactory method is to use the call in conjunction with a calibration graph.

### Definite Identification.

For it frequently happens that stations relay programmes from other stations in which case the call heard will usually be that of the station being relayed, not that of the one to which the set is tuned. As an example of this, when listening to Horby the call is often heard to be "Stockholm—Motala."

By checking up with a calibration curve, it is found that it cannot be either Stockholm or Motala, but that the set is tuned to 257 metres which is found to be Horby's wave-length. Thus the identity of the station is established.

In this connection it must not be forgotten that on special occasions stations relay programmes from entirely different countries. Thus, if you hear the announcement "Berlin," it may be Vienna relaying an International Programme. However, by consulting your calibration curve you will find that there is no relay of Berlin anywhere near 517 metres.

Another way in which the graph can prove very useful is when you hear a new station you can read off the wave-length nearly accurately and can then look in a list of wave-lengths for the most likely stations, and will then know which of two or three calls to expect.

### Smooth Reaction Necessary.

Sets which have ploppy reaction or reaction overlap will never give as good results on distant stations as they should; so here are a few hints for getting rid of these nuisances.

A cure can often be made by careful adjustment of H.T. and L.T. voltages on the detector, and even H.T. on the H.F. valve. A different value of grid leak and size of reaction coil will probably help.

If it is a very obstinate case, much can be done by using a potentiometer to control the voltage on the grid of the detector. For this job a baseboard-mounting potentiometer of 200–400 ohms is needed, and should be screwed down to the baseboard as near as possible to the grid leak.

The lead which goes from the grid leak is then disconnected from the filament wiring and taken to the arm of the potentiometer (usually the middle of the three terminals). The remaining terminals are then connected across the L.T. wiring. By adjusting the arm it should now be possible to obtain smooth reaction.

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# MIXING YOUR CURRENTS

by "PENTODE"

**If a detector valve rectifies the H.F. energy, how can there be any H.F. in the anode circuit to feed back via a reaction arrangement ? That is a question that seems to trouble a large number of our readers, and it is clearly answered in this interesting article by a popular "P.W." contributor.**

ONE thing in radio that seems to cause more confusion than anything else is the form of anode current in a detector valve.

A detector valve "rectifies" the energy handed over to it and "transforms" high-frequency current effects into low-frequency currents.

Where then is the H.F. energy that is handed back from the anode circuit to the grid circuit for further amplification by means of some reaction arrangement ?

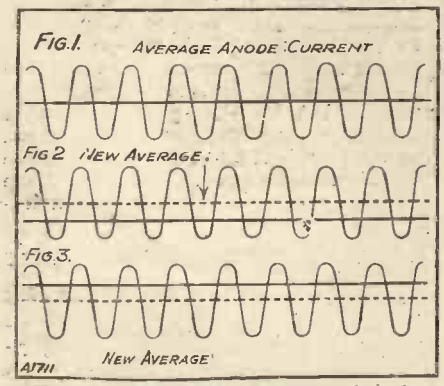
These last two paragraphs consist, not of words of my own, but of extracts from a letter I have received. They represent the essence of quite a lot of my correspondence.

### A Tricky Question.

It is a very tricky question and, although it can be answered quite easily, I am not sure that I shall be able to do it in one short article. However, I will try.

The point I have to get over is that the anode current in a detector valve does vary at high-frequency, but the variations are

## PLOTTING AVERAGES.




How the anode current average varies when rectification takes place.

such that the *average value* of the anode current swings up and down at low-frequency.

An H.F. valve operates in this way—when it is working properly. The H.F. energy developed in the aerial is impressed on the grid. Now this H.F energy comprises equal positive and negative impulses. That is, its positive impulses are of exactly the same intensity as its negative impulses—they always are, and that is a point to remember.

This being so, you can see that the fluctuations in the anode current that are caused by this "grid tickling" are rises and falls that are exactly equal in value.

Therefore, the *average* value of the anode current remains unaltered. Every *decrease* of, say, ¼ milliampere. is immediately followed by a return to normal and an *increase* of ¼ milliampere. The one effect is, in a sense, balanced out by the other.

Put a pair of 'phones in circuit and you hear nothing. The 'phones cannot follow current fluctuations of such high-frequency. And the same applies to a meter. The meter's needle remains stationary, showing *average* current. It cannot show rises and falls occurring a million or more times per second.

If its needle started to move in accordance with a decrease in current occasioned by a negative impulse on the grid it would not get far before the accompanying positive tried to make it move an equal way upwards, as this opposite effect would occur less than a millionth of a second after.

An anode current that is varying equally with negative and positive H.F. impulses on the grid can be shown as at Fig. 1. A milliammeter would record the average current, as shown by the straight line, and a loud-speaker or telephone receiver would remain quite dumb with such a current passing through.

### What Rectification Does.

Now let us see what happens when a detector valve is at work. Detection or Rectification is carried out by one or other of two well-known systems, viz., grid leak and condenser, and anode bend. The effect of either is that equal grid voltage variations are no longer followed by equal anode current fluctuations.

There may be a smaller decrease of anode current accompanying, for instance, a 1-volt negative grid charge than there is an increase when there is a 1-volt positive grid charge.

Supposing there were a steady train of H.F. variations, unvarying in strength, such as you get when you are tuned to a station that is not, at the moment, using its microphone.

If the positive impulses were increasing the anode current of your detector valve more than the negative impulses were decreasing it (bottom bend rectification) the effect would be (Fig. 2) to increase the *average* of the current.

If, on the other hand, the negative impulses decreased the anode current more than the positive impulses increased it (Fig. 3), obviously the average of the current would fall.

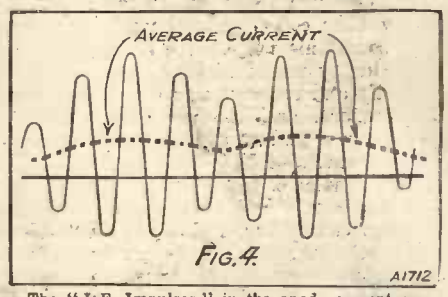
And a meter could show you either of these new average currents.

### Modulated Impulses.

When the broadcaster's microphone comes into operation and *modulates* the H.F. energy the impulses get larger and smaller over periods corresponding with low-frequencies of the speech and music (Fig. 4).

Telephone receivers can, of course, be actuated by a fluctuating average current of

## THE L.F. IMPULSES.




The "L.F. Impulses" in the anode current are really variations in the *average* of the current fluctuations occurring at High-Frequency.

this kind, but an ordinary meter cannot follow even these comparatively slow fluctuations. Its needle reads a new average current, an average current represented by the "mean" above and below which our "average" fluctuates at audio-frequency.

But there are still H.F. variations present, as you can now see. If you put an H.F. choke in the anode circuit you tend to reduce the effective intensity of this H.F component of the current, although, as you will know, you must not interpose an H.F. choke in series in that part of the circuit directly constituting the reaction arrangement.

*READ*

**MODERN WIRELESS**

BRITAIN'S BEST RADIO MAGAZINE

THERE seem to be two quite different points of view about the construction of a wireless set. The majority of set-builders appear to desire a job which is as easy as possible, with ready-made parts throughout, so that they can finish the set quickly and easily, and then get it into operation with as little trouble as may be.

In other words, they do not find so much pleasure in building the set as in using it when finished; they do not regard the constructional work as an end in itself, but merely as a necessary preliminary to the pleasure which the completed set will give them. This, no doubt, is the practical point of view, and it is the one we have in mind when producing a large proportion of our set designs.

However, correspondence shows that a certain proportion of our readers take the opposite view, and regard the constructional work very much as a hobby in itself, a natural attitude for anyone who is fond of handicrafts in general.

### Low-Cost Construction.

This type of constructor obtains much of the pleasure he derives from the finished receiver from the feeling that he has really MADE at least some part of it, rather than merely assembled a lot of bought components. He finds real satisfaction in actually making some of the parts for the job, and if he is unable to do that in any particular case, he takes pleasure in building the set and lingers over the constructional work, rather than hastens it.

It is with the needs of this reader chiefly in mind that we have produced the "Economy" Three. It is fundamentally a set designed to appeal to the man who really likes constructional work, but it is also something more. We have taken the opportunity presented by such a design to simplify and economise to a very considerable extent, and the result has been to bring down the cost of the set to a remarkable extent.

As a matter of fact, the total cost of this receiver is only just about the same as the average two-valver, and it should make a very strong appeal not merely to the enthusiastic constructor, but to anyone who may be looking for the best possible set for a very moderate expenditure.

Simple as the design is, we have spent a very considerable amount of care upon it, because while we wished to appeal very strongly to the keen constructor we wished to arrange also so that anyone who was merely looking for a very economical proposition should be able to make it entirely from ready-made components if he so desired. When you look over the design you will find that there is not necessarily a very great deal of extra constructional work involved, and such as there is can be omitted entirely by those who so desire by the simple expedient of using bought components and normal methods of construction.

### Make Your Own.

Let us just explain what this extra constructional work really is before we go any further. Well, first of all we are suggesting that instead of the conventional ebonite panel the set should be provided with a wooden one, a very pleasing appearance being obtained in this way if you use some suitable plywood, especially if you finish off the edge with a little beading all round, and stain and polish the surface of the wood. (A suitable varnish stain is an effective method of obtaining a good finish.) Those who want to cut out all extra work of this nature can, of course, adopt the obvious expedient of using just the ordinary ebonite panel.

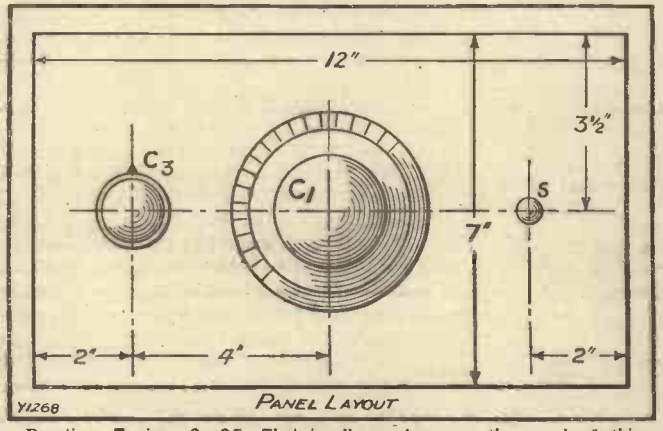
The use of a wooden panel, of course, is something of an economy, but it is not on devices of this nature that we have relied to get down the cost of this set. On the contrary, we have adopted a more radical method, namely, very thorough revision and working out of every detail of the circuit to eliminate every component which is not strictly necessary for obtaining satisfactory results, choosing the simplest possible type of circuit, and then carefully arranging the set so that inexpensive types of components shall serve our purpose efficiently.

To do all this and yet fully maintain the efficiency of the receiver has been something of a task, but we have devoted a lot of time and scheming to it, and we feel confident that anyone who builds the set will agree that we have succeeded.

Now about the home construction of certain of the components. This affects what would have been three separate components, but by the special system of construction suggested for two of them, they are combined into one unit, and so the total is reduced to two. First of all there is the grid condenser, and this is a particu-

**This is a special "P.W." design for the economist. F Research Dept. to keep down construction and maint set. The outfit loses nothing whatever in the proces trol, its smoothness of operation and its powerful D X**

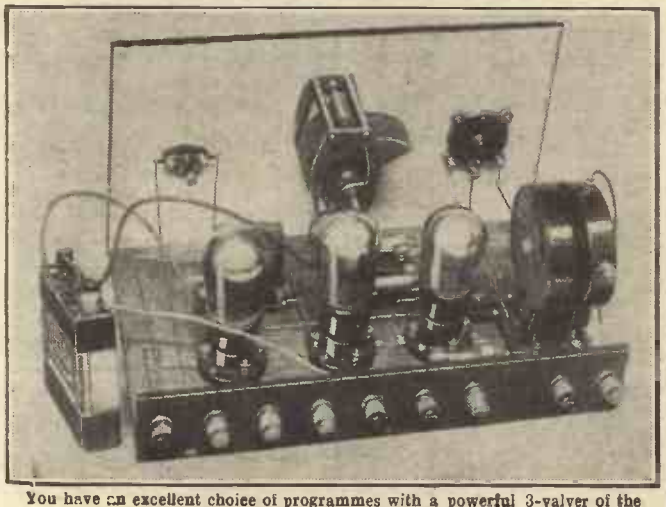
## ONLY THREE PANEL ITEMS




**Reaction—Tuning—On-Off. That is all you have on the panel of this "Economy" Set.**

## A REAL "VALUE FOR MONEY" DESIGN

## THE PROGRAMME PULLER



**You have an excellent choice of programmes with a powerful 3-valver of the calibre of the "Economy" Three.**

### THE PARTS REQUIRED FOR THE

- 1 Panel 12 in. × 7 in. (wood or ebonite). See text.
- 1 Cabinet with baseboard 7 in. deep (a home-made cabinet is well within the powers of the constructor who is fond of woodwork).
- 1 ·0005 mfd. variable condenser (Lissen or Lotus, Igranic, J. B., Ormond, Ready Radio, Polar, Dubilier, Burton, etc.).
- 1 ·0001 to ·0002 mfd. differential reaction condenser (Ready Radio or Formo, Lissen, Lotus, Burton, Dubilier, Ormond
- 1 On-off switch (Junit Igranic, Benjamin, Lo ite, Ready Radio, etc.)
- 3 Plain valve holde type are not sti for the modern improv (W.B. or Burton, etc.)
- 1 ·0003 mfd. fixed conden made or commercial).
- 1 Baseboard-mounting holder (home-made mercial). See text.
- 1 Resistance-capacity co

## EASY-TO-MAKE, INEXPENSIVE, SIMPL

**Every effort has been made by the "P.W." to maintenance costs in this effective three-valve ers and its simplicity in assembly and con- qualities are important added attractions.**

larly easy component to make for yourself. If you do not wish to make it you can just purchase the usual fixed condenser of ·0003 mfd.

If you feel inclined to try your hand at making it, however, you will find that we published full details of one in "P.W." for March 30th, 1929, and we here repeat a condensed account of the job. First, you require two small pieces of ebonite, one measuring 1½ ins. square, and to fit over the top of this, one 1½ ins. × 1⅛ ins. These pieces of ebonite simply form clamps, so you arrange for them to be screwed together tightly by means of four small brass screws passing from the smaller one into the larger one. By the way, if you do not possess means of tapping the holes in the lower piece of ebonite, you can at a pinch use round-headed wood screws, if you drill suitable holes in the lower piece of ebonite.

This little condenser has only two plates, each measuring 4 × 1 centimetres. These plates overlap for a length of 3 centimetres, the outer end of each plate being left projecting outside the unit.

The plates are, of course, clamped between the two pieces of ebonite, with a sheet of thin mica between them, the correct thickness for this mica being about ·002 ins. Connections are made to the condenser by soldering direct to the projecting ends of the plates, which should be of fairly thin copper foil, so that they can easily be cut to size with scissors.

### Only Eight Baseboard Parts.

The other home-made component is a baseboard-mounting two-coil holder to replace the usual pair of single-coil sockets which would be screwed down upon the baseboard. (Of course, if you like you can use just the ordinary two separate sockets of the ready-made variety.)

A component of this type was fully described in "P.W." some time ago, and the idea is that you should obtain a small piece of ¼-in. ebonite measuring about 2 ins. square, and mount upon this the metal parts obtained from a couple of the cheap single-coil holders you can get from many dealers. The result is a very useful little component which saves a certain amount of constructional work in the set, because it gives you only one component to screw in place instead of two.

To make this component you just require the correct spacing between the various parts. Between the pin and socket of each holder there should be a space, measuring from centre to centre, of 9-16 of an inch. Between the two holders a suitable spacing is 1⅛ ins., again measured from centre to centre. (This latter is the space from the centre of one coil to the centre of the next when placed in the holders.)

By the way, this useful component was originally described in the issue of "P.W." to which we have referred, together with a three-coil version, and it has since been placed upon the market by the enterprise of Messrs Wright & Weaire, so that you can obtain a ready-made specimen if you so desire. Holders of this type are very useful in carrying out experimental work, as well as for actual set construction.

The rest of the work is a perfectly straightforward job of laying out the components and wiring them up, and in doing it we think you cannot fail to appreciate the exceedingly simple and straightforward arrangement we have adopted. On the baseboard you will find there are actually only eight components to be mounted, which must be something of a record for a three-valve set.

### Circuit Economies.

This severe economy of parts, of course, results from a very careful simplification of the circuit involved, a point which you will appreciate when you examine the circuit diagram. You will find that the receiver consists of a very straightforward arrangement of a detector and two low-frequency stages, with a form of aerial circuit in which the tuning coil is also used for coupling purposes.

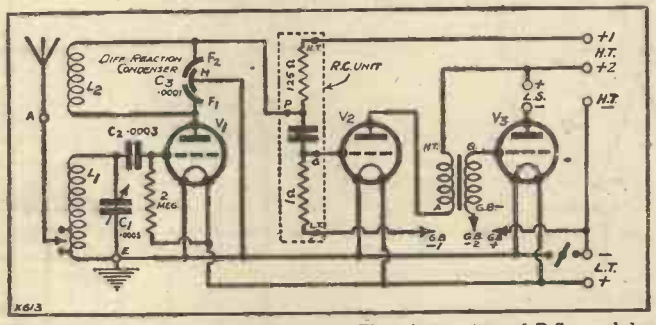
Reaction, as you will observe, is of the improved differential type which we use in The "Magic" Three with advantages no doubt well known to the reader.

A point to note here is that we have found it possible in this design to dispense with the usual H.F. choke, the necessary plate circuit impedance to enable reaction to be obtained being found in the anode resistance of the resistance-capacity coupling unit which transfers the signals from the detector to the first low-frequency valve.

The second L.F. stage is transformer-coupled, and you will note that there is space upon the baseboard at this end of the set for the usual 9-volt grid-bias battery, for which you could provide a pair of clips if you desire.

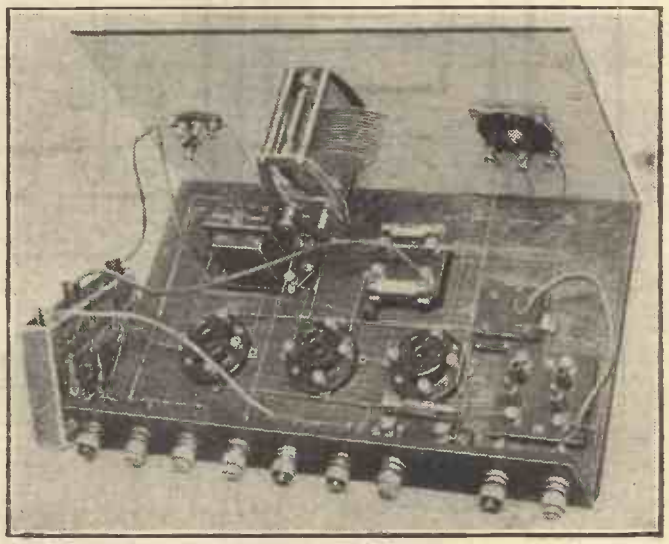
*(Continued on next page.)*

## RIGHT UP-TO-DATE




The circuit is perfectly straightforward. There is one stage of R.C.-coupled L.F. and one of transformer-coupling, and the special "P.W." differential reaction scheme is employed.

## A 100% RECEIVER.



No efficiency has been sacrificed to achieve the attractive qualities possessed by this fine receiver.

### "ECONOMY" THREE.

| | |
|---|---|
| ). | (Lissen or Dubilier, Varley, R.I., |
| or Lissen, | Mullard, etc.). |
| tus, Wear- | 1 Low-ratio L.F. transformer (R.I. |
| ). | Hypermite, or Igranic type J, |
| the sprung | Varley Nicore No. 2, Lissen, |
| necessary | Telsen, Ferranti, Mullard, Cossor, |
| red valves). | etc.). |
| . | 1 2-megohm grid leak and holder |
| iser (home- | (Dubilier or Lissen, Igranic, |
| See text. | Mullard, Loewe, Ediswan, etc.). |
| two-coil | 1 Terminal strip 12 × 2 in. |
| or com- | 9 Terminals (Belling and Lee or |
| | Igranic, Eelex, Burton, Clix, etc.). |
| upling unit | Wire, screws, flex, G.B. plugs, etc. |

# Y OPERATED AND POWERFUL

## THE "ECONOMY" THREE.

*(Continued from previous page.)*

The remainder of the constructional work you will find is so simple that just a glance at the photographs and then at the wiring diagram will be all the assistance you need. We would just point out, however, that the wiring is so simple and well spaced that you can quite well use ordinary bare wire for the connections if you wish.

Now for the necessary operating details. The valves should be two of the H.F. type with an impedance of perhaps 20,000 to 30,000 ohms for V1 and V2, and a small power or else super-power for V3. There are only two H.T. positive terminals, so the connections here are very simple.

**H.T. and G.B.**

Terminal H.T.+1 supplies the detector, and here you will want a voltage of perhaps 60 to 70, with a little adjustment to secure the smoothest possible control of reaction. Terminal H.T.+2 supplies both the low-frequency valves, and here you want some 100 to 120 volts. The set will work with considerably less, of course, but in the interests of good quality it is not advisable to go much below 100 volts.

Grid bias is very much a matter of the particular valves you employ, although on G.B.—1 you will almost certainly want 1½ volts negative, while G.B.—2 will usually want from 6 to 9 volts negative for the ordinary power valve. Super-power types vary considerably in the grid bias they require, and so you should be guided by the makers' data slip.

Now about the coils. Carrying on the idea of home constructed parts where desired, we are suggesting that you should employ in this receiver the set of home-made coils to be described in our next issue, but you can just as well use standard commercial plug-in inductances if you wish.

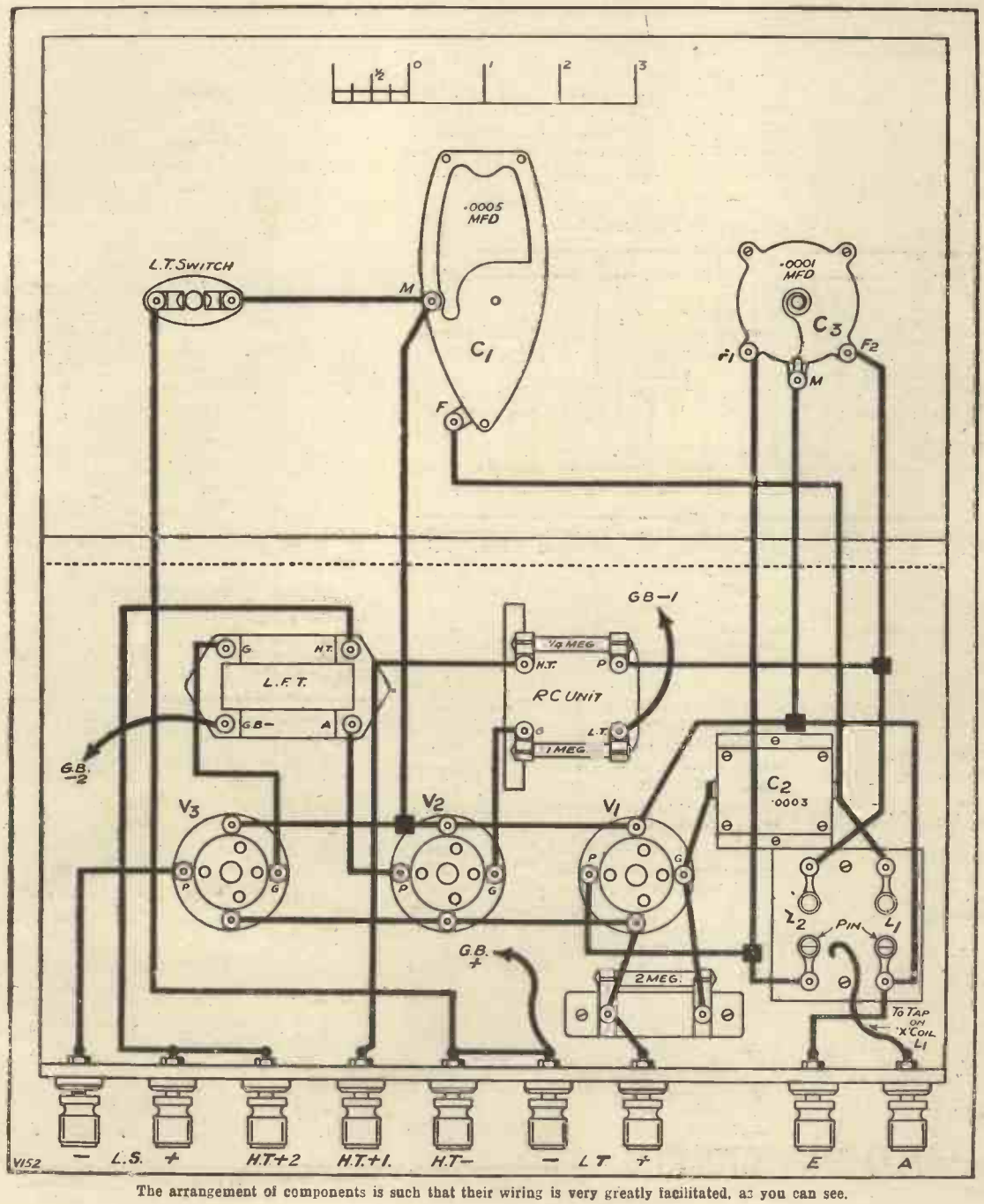
**The Coil Sizes.**

The sizes are as follows:

$L_2$ will usually be somewhere about a No. 35 or 40 for the lower wave-band, and $L_1$ should be a No. 60 of the "X" type. The long waves will need for $L_2$ a 75 or 100, and for $L_1$ a 250 X. The flex lead from the inner side of the aerial terminal, by the way, should be tried first on one and then on the other tapping on the "X" coil to see which gives you the best results with your particular aerial.

There now, you are ready to put the set into operation, and we do not think there is much doubt about your verdict. The receiver put up a really excellent performance on test, and when you bear in mind its extraordinarily low cost we do not think that any constructor can fail to be thoroughly pleased with it.

## QUITE EASY TO WIRE UP.




The arrangement of components is such that their wiring is very greatly facilitated, as you can see.

## RADIO ITEMS OF INTEREST.

Although a small grid-bias battery as used for H.F. stages has a very long life, do not imagine that it is everlasting, or you may be troubled with a mysterious and hard-to-define loss of efficiency and crispness.

* * *

One of the best methods of reducing very bad local interference from electric machinery, etc., is to use a frame aerial, but unfortunately owing to the loss of pick-up an extra H.F. stage will have to be used in order to get approximately equivalent strength.

* * *

Although it does not matter in the least which way round a pair of telephones is connected when used with a crystal set, it is important that the 'phone leads are joined the right way round when a valve set is used.

# CAPT. ECKERSLEY'S QUERY CORNER

USING THE MAINS — INDUCTANCE AND CURRENT—THE AERIAL SERIES CONDENSER.

**Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., Late Chief Engineer of the B.B.C., and now our chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.**

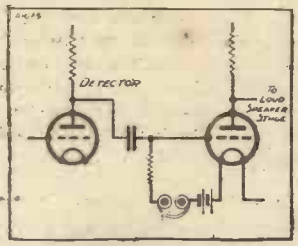
### Using the Mains.

H.M. (Forest Hill).—"When using an all mains receiver from A.C. is it necessary to use an earth, or can the earthed side of the mains be used?"

Use an earth always, when an earth terminal is provided. I mean, a separate earth, and not the earthed side of the mains.

### Working 'Phones at the Same Time as Loud-Speaker.

M.D. (Accrington).—"I have a three-valve set in which I wish to arrange a pair of 'phones and a loudspeaker, the 'phones to be used in another room in the house. What is the best method of connection, and of controlling the volume in the 'phones?"



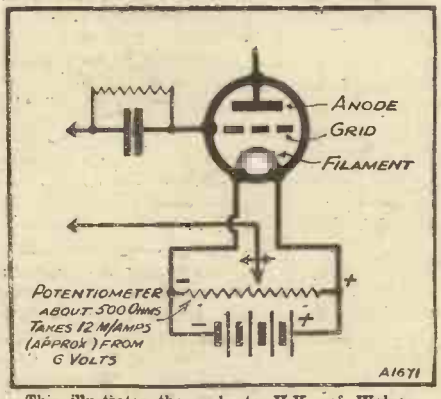

The method of inserting telephones which is recommended by Capt. Eckersley in reply to an Accrington reader's enquiry.

There are two or three ways to do this. You can put the 'phones in the anode of the detector valve, but you get high tension all over the place and you might get shocks.

You can put the 'phones in parallel with the loudspeaker, but put the 'phones themselves in *series* with a very high resistance. This has the effect of cutting down the volume in the 'phones and of not cutting down the volume or changing the apparent impedance of the loudspeaker. The trouble, again, is too much H.T. knocking about if your output to loudspeaker is not through a transformer.

I think the best place is the earthing side of your post detector stage, as shown. The same applies if you have transformer coupling, that is, put the 'phones in the secondary of the transformer which has its primary in series with the detector anode.

### USING A POTENTIOMETER




This illustrates the reply to H.K., of Wolverhampton.

### The Grid Leak Return.

H.K. (Wolverhampton).—"Will you explain why, in a leaky grid detector, sometimes the grid leak is connected across the grid condenser and sometimes to L.T.+? Has one method of connection any advantage over the other, or does it depend on the receiver circuit?"

You can use a leaky grid detector with some positive bias. Thus if you bring your grid back to the L.T.+, you put L.T. volts positive on the grid.

Sometimes, and mostly dependent upon the valve, one gets better results this way. My advice to anyone is to try what is best, and to that end, I suggest the use of the potentiometer as in the diagram. By moving the slider you get from full L.T. volts + on the grid to 0 volts on the grid, and you can find out if any intermediate value is better.

### Inductance and Current.

R. S. (Portsmouth).—"With the intention of buying an L.F. choke for my set, I approached a certain maker, who asked me whether I desired a constant inductance choke or one of an ordinary type, since he made both.

"He mentioned that the latter decreased in inductance as the current through it was increased, whereas the other remained practically constant whatever the current up to a specified maximum. The constant inductance choke had a slightly greater D.C. resistance than the other choke. Can you please assist me in my choice?"

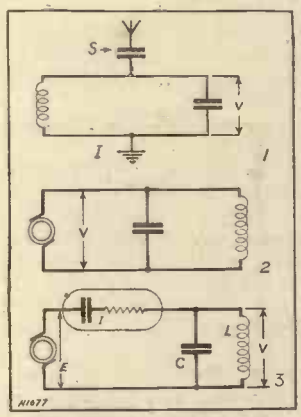
If you want a choke-capacity output you have a varying current in your anode circuit, and so surely you don't want the inductance to vary with this varying current, otherwise the magnification *may* vary with this varying current.

You see, a valve can be written down as a *generator* of alternating current with internal resistance—we can draw it like this (see diagram on right).

The voltage Vg will be determined partly by the value of the anode impedance. If the anode impedance varies with the value of A.C. then Vg will vary. This would produce non-linear response.

### The Aerial Series Condenser.

C. M. (Dulwich).—"I have been advised to insert a condenser in series with the aerial lead to my set to improve selectivity. If a ·001 mfd. is inserted, will it have a greater or lesser effect than a ·0001?"




Series Condenser and Selectivity.

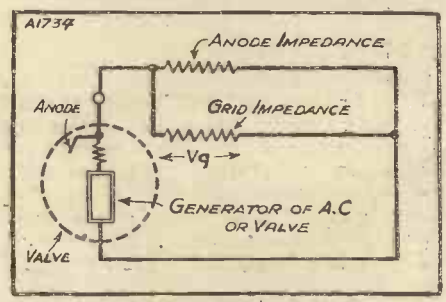
The selectivity of this type of aerial circuit is improved by the insertion of an aerial series condenser as shown at S. Within reasonable limits the *smaller* the condenser S the better the selectivity. So your 0·0001 is nearer the mark.

You see, you want to appreciate a voltage V as shown. If we replace the aerial by a generator (2), and assume the aerial has no resistance, then V will never vary.

But if we put an impedance in as in 3 then V will be proportional to the impedance of the closed circuit—CL divided by the sum of the impedance of I and that of C.L.

So the greater I, the more V will vary, as the impedance of CL varies with frequency, *i.e.*, the greater the selectivity.

### THE CORRECT CHOKE




"The voltage Vg is determined by the anode impedance."

# SHORT-WAVE NOTES.

**A discussion on current short-wave topics, stations, reception, and "the eleven-year curve."**

**W. L. S.**

ONE correspondent has written to me with the information that the station G 2 I V that everyone has been logging is in reality G 2 I D, and belongs to the "Majestic." Since this is the only letter out of a hundred or so that questions G 2 I V, I think there must be a mistake somewhere. At all events, I think we have heard enough of G 2 I V, G 2 G N, G 2 A A, and W O O for a little while.

Conditions continue exceptionally poor for this time of year, but we are hoping daily for an improvement. A strange feature is that throughout blank periods of this kind there often seem to be one or two isolated stations that continue to come through as if nothing had happened.

For example, while home unexpectedly one afternoon recently I put on the 'phones and heard V S 7 A P (old A I—5 V X at Colombo, Ceylon) coming in at a good R6/7, and, switching on the transmitter, "raised" him without the least difficulty, my own signals being reported the same strength.

### Peculiar Cycle of Conditions.

I think I mentioned Q.S.T.'s remarks about the only curve that Dr. Hoyt Taylor has never plotted—the eleven-year curve corresponding to a regular change in a cycle of that nature on the part of the Heaviside Layer. Certain it is that, where amateurs could work with United States stations under good conditions on 200 metres in 1924, they would have their work cut out to do it nowadays; and even the 80-metre band is by no means what it was.

Possibly the 40- and 20-metre bands have reached their peak and will get steadily poorer for the next five years or so, while the higher bands improve. It makes amateur radio seem quite futile as anything but a hobby if even the higher-powered amateurs are powerless to work over any great distance periodically like this. On the other hand, what a nasty one for the commercial stations! They have faithfully followed the amateurs down and down, and it will be mildly humorous if they find that they have to follow them *up* again!

A reader in Ceylon uses the Shortradyne, and wants to know how to add a screened-grid stage to stop undesirable effects due to the swinging of the aerial. Well, N. P., space is too limited for a circuit diagram, but the arrangement is precisely the same as that of a screened-grid stage before a straight detector and L.F.

### The S.G. "Buffer" Stage.

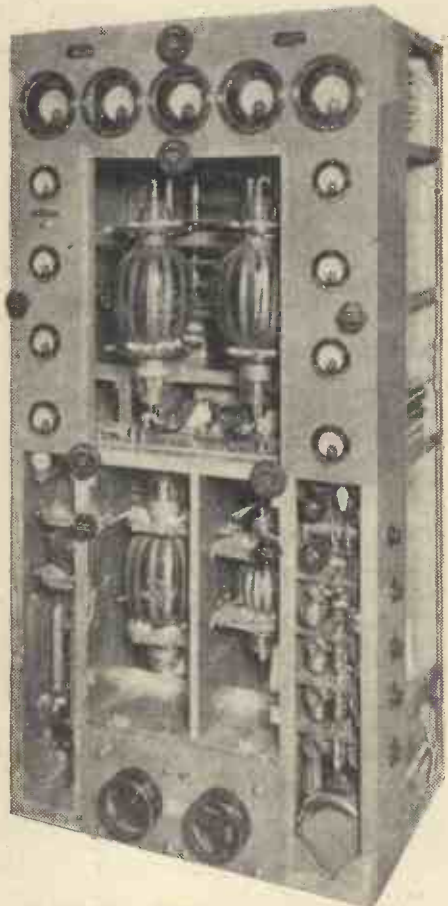
Connect a 10,000-ohm resistance or a good H.F. choke across grid and filament of the S.G. valve, applying the aerial directly to the grid, and take the anode, through a small condenser, on to the top of the existing grid coil. You can either use a variable condenser to reduce the degree of coupling or you can use a fairly large fixed condenser and tap down the coil until you have got things just right.

The H.T. is fed to the anode, of course, through a choke, and you will find a variable feed to the screening electrode (by means of a potentiometer) a help in controlling reaction and general operation.

I note your remarks about 5 S W and the Naval Conference. Another reader in distant parts was commenting on the excellence of the King's speech (via the Dutch station P H I!). He observes that on these occasions patriotism is all very well, but when the Dutchman is four times the strength of the Old Country—well, who wouldn't!

G 5 B D reports a remarkable occurrence that is, I think, worth immortalising as the "G 5 B D effect." He feeds his 'phones through a 1—1 output transformer, and finds that when he inserts an H.F. choke in each lead he cannot move his hands or body within two feet of the set without stopping or starting oscillation. Blind spots and a marvellous threshold howl are other effects arising from this. On removing the H.F. chokes the set is its old self again.

## "SOMETHING LIKE" A TRANSMITTER.



This is the short-wave transmitter employed by Marconi during his recent radio-control experiments between his yacht "Elettra" and Sydney, New South Wales. Many amateur transmitters will no doubt wish they could use such large "bottles."

A Harrow reader has been receiving a number of interesting things, including the Graf Zeppelin early in April, on 60 metres. (Incidentally, did anyone hear her during her recent trip to London and Cardington?) Another station heard is the M.Y. Heroic, 2,000 miles out, working with W E S. The call sign H A F—O N A F you mention is, I expect, the Hungarian amateur H A F—9 A F. For some unearthly reason the Hungarian Government seems to have allotted the three letters H A F as prefix. Congrats on your log, G. Q. E.

Two or three people seem to have heard a new Siamese station (H S P) at Bangkok working with Paris on 16·8 metres, from 14.00–15.30 G.M.T. As a cure for threshold howl someone suggests winding flex all round the four feet of the cabinet (if any) and earthing it. It doesn't seem very likely to me. Why not build the set in a birdcage?

### Those Long-Distance Telephones

It seems time to me that some of the long-distance telephone services were made a little more secret. I recently heard some very intimate conversations being carried out obviously in blissful ignorance of the fact that numberless listeners were hearing them all. And a Luton reader reports V K 2 M E (Sydney) asking for a Maida Vale number in the most unconcerned manner.

A Welsh reader reports hearing a re-broadcast of the National Programme "7 degrees above the transatlantic telephony." As I don't know which transatlantic station it was, I am not able to say whether this was 7 L O or not, but I believe 7 L O is about the only station that does this.

My regular correspondent from Cincinnati has been kind enough to send a copy of the "New Zealand Radio Record," in which is an article on the station R A—97 at Khabarovsk, U.S.S.R., which broadcasts Bolshevist propaganda on short waves and is apparently rather a nuisance in the Antipodes.

In other papers I have seen several mentions of this station, but have never heard it myself, and it does not appear to worry us much in Europe. He says that some of the U.S. stations now exclusively occupied in spreading jazz and advertising matter might be better occupied in combating this harmful propaganda, either by "sitting on" the offending station or by so crowding the ether that it passed unnoticed!

### Empire Chain Wanted.

I am not criticising the B.B.C. or 5 S W myself, since I can in a way see the various points of view involved, but it does seem a pity that we cannot establish a chain of Empire short-wave broadcasting stations.

The stations in various parts would come in at different times of day, and there should always be a chance of hearing one or other of them; and one would imagine that when the scheme was perfected the system could be run much as the B.B.C. controls its chain of stations, as far as arrangements were concerned for "S.B." transmissions, etc.

A dream of the future, undoubtedly, but if something of the sort is not in existence by 1932 I shall be surprised and disappointed. With some really high-powered telephony stations on correctly-chosen wavelengths I should have thought it a moderately easy matter to relay a programme half way round the globe.

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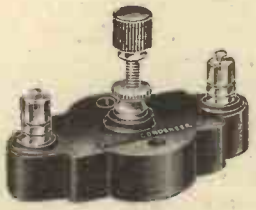

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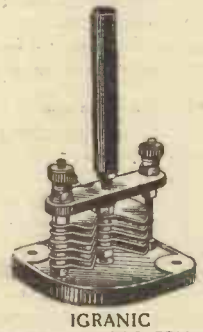

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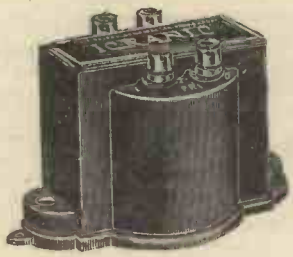

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C.F.H. 2

## Well! Who *was* right?

REMEMBER that terrific argument you had with John the other night? Neither of you would give in, and so it went on for hours and hours. But who was really right after it all? You don't know, do you?

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# FROM THE TECHNICAL EDITOR'S NOTE BOOK.

## Tested and Found—?

### RADIO RESEARCH REPORT.

THE report of the Radio Research Board was recently issued, and copies can be obtained from H.M. Stationery Offices price 3s. 6d. It contains some very interesting matter. There is a quite fascinating account of some investigations relative to atmospherics, but I would warn "P.W." readers that much of the material needs a fair knowledge of the more scientific aspects of radio before it can properly be understood.

### A NEW L.F. CHOKE

The following is an account by the Radio Instruments people of the evolution of something of unusual interest and importance in connection with L.F. chokes:

"The successful application of nickel iron in cores of intervalve transformers and radio receivers induced our Research Department to undertake a line of research with the object of using nickel iron for the cores of filter and smoothing chokes.

"The 'Hypercore' nickel iron choke, which is, we believe, the first commercial nickel iron choke to appear on the market for use as a filter choke for smoothing circuits and mains receivers, is a direct result of this research.

"The chief advantages are the reduction in weight and size for a given inductance and D.C. resistance, as against existing chokes employing cores built from silicon iron laminæ. The reduction in the number of copper turns used in the winding reduces the self-capacity, and this, coupled with the lower losses of nickel iron at frequencies between 3,000 and 4,000 cycles, makes this type of choke much more efficient as a smoothing choke, in addition to improving the quality of reception when used as an output choke.

"The weight of the 'Hypercore' is only 18 oz., as compared with the weight of 2 lb. 14 oz. of our standard silicon iron model. The area is also correspondingly reduced, so that the 'Hypercore' will enable manufacturers to reduce the weight and size of the mains part of their equipment.

"In modern receivers a choke capacity coupler is sometimes employed between a final output valve and the previous valve. The 'Hypercore' used in this position will give the uniformity of amplification necessary with this coupling arrangement.

"The high value of inductance shown in the accompanying curve is well maintained even at maximum current. It will be seen that with a current of 50 milliamperes the inductance is still 20 henries, and these two values cover the ordinary commercial requirements of most manufacturers and experimenters. The choke is designed to stand a maximum current of 75 milliamperes.

"It is mounted in a beautiful bakelite moisture-proof case, which ensures efficient clamping of the laminæ and absolute freedom from mechanical hum.

"The production of this choke is a further example of the enterprise and pre-eminence of British radio manufacturers in modern research. This improved nickel iron choke will no doubt be the forerunner of others, and for radio purposes will probably become standard throughout the industry."

I have very carefully tested the R.I. choke, and I find that it is an excellent proposition. Its use undoubtedly does make for improved results, and this is particularly noticeable in regard to the high notes.

There is a definite increase in response at frequencies of the order of 3,000 upwards.

By the way, choke-capacity outputs now become a possibility with the larger portables. But this is only an incidental advantage. The "Hypercore" is not confined to any one particular use, but has a general application to radio set construction of a wide nature.

### PHILIPS' ALL-MAINS SET.

In our March 1st issue I made a few preliminary remarks concerning the Philips All-Mains Four-Valve set, an instrument that has been very extensively advertised and which has achieved some considerable popularity and reputation.

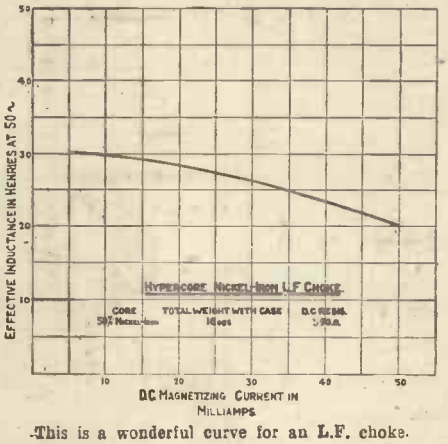
I have now been able to give a further sample a series of tests in varying conditions, and find it excellent. Its sensitivity is above the average, and stations simply pour in at full loud-speaker strength all round the dial on the lower wave-band.

On a 30-foot aerial only 20 feet high (a badly screened aerial at that) the efficient volume control had to be used continuously to keep the volume down to "room strength."

The quality of reproduction is very fine indeed, and the maximum undistorted output on a large moving coil loudspeaker is enormous. (A P.M.24A valve figures in the last stage!)

The set is wonderfully selective, and it was possible to tune in to Konigswusterhausen with only a very faint background of 5 X X, even although, normally, these stations heterodyne. The separation of the Regionals and the lower wave foreigners is an easy matter with this Philips set.

The smoothing is perfect and there is not the slightest trace of hum on an ordinary cone speaker.




This is a wonderful curve for an L.F. choke.

Altogether I consider the Philips set an outstanding proposition, and one I can thoroughly recommend in any circumstances to discriminating listeners.

It is very unfortunate indeed that the first model I tested proved to have a slight fault (probably due to rough handling in transit). There is now no doubt in my mind that Messrs. Philips deserve all the good things that are said about their all-from-the-mains receiver.

### IGRANIC SWITCH ADAPTOR.

I have just received details of this latest production of the Igranic Electric Co., Ltd. It is a device that enables any ordinary set immediately to be transformed into a "Radio-Gram" outfit.

You pull out the detector valve and insert the adaptor, and replace the valve in this. You can then switch over from radio to records at will with the switch that is provided.

Suitable grid bias can be applied. The adaptor is described in the Igranic leaflet No. 6,650.

### WHEN YOU ARE BUYING—

#### (13) GRID LEAKS AND CONDENSERS

**Remember that, while the values of a grid leak and a grid condenser can be varied quite a bit without affecting the operation of a set, a wide departure from the specified ohms and mfds. may cause a great deal of trouble.**

**Grid leaks and condensers made by the most reputable of manufacturers do not cost much, so don't save a penny or two and risk bad results by "picking up" such items from junk shops.**

**In some cases Grid Leaks and Condensers are combined and provided with only two terminals. Such combinations do not suit some sets when the leak and condenser require to be in series. The three-terminal assembly is needed for such cases.**

### THE DUONATOR.

This is a combined grid leak and condenser made by C. D. Melhuish of Highbury. It retails at 2s., and comprises a ·0003 mfd. condenser and 2 megohm grid leak. These elements are built into a neat moulding with a central fixing hole. There are three terminals, and the leak can be connected either in series or parallel. The device is remarkably compact, and on test I found the resistance and capacity sufficiently close to the rating.

### INSULATED CONNECTING LEADS.

The neat wiring of a radio receiver necessitates a certain amount of care and time. If insulated wire is used there is the fiddling process of baring the ends of the leads, while if "spaghetti" and bare wire are employed there is the tricky business of matching of lengths. On top of all this, either neat loops have to be formed or soldering carried out.

A complete alternative is provided by the insulated connecting leads manufactured by Ready Radio Ltd. These are supplied in sets, at 2s. 6d per set. One set embodies enough complete leads to wire up any ordinary receiver. They are insulated leads and are provided with metal eyelets which you just drop over the terminal shanks and screw down the terminal nuts to form excellent contacts. They are then every bit as good as soldered leads.

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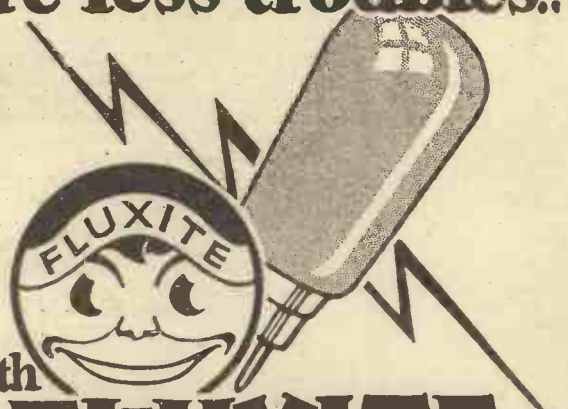


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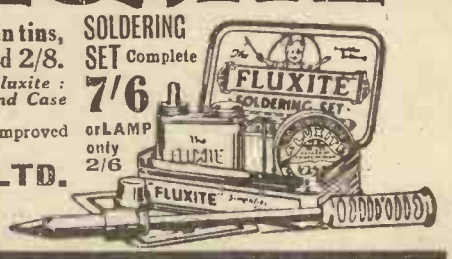


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*The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

# QUESTIONS AND ANSWERS

### ADDING H.F.

L. O. (Hampton Court).—"Is it a fact that adding a high-frequency stage to a receiver tends to make it unstable and oscillate?"

Yours is "rather a big question." It can be said, however, that a properly designed high-frequency stage added to a properly-designed receiver will *not* necessarily introduce any tendency towards oscillation.

Yet it frequently happens that the effect of adding a high-frequency stage to a set results in oscillation, because either the amplifier or the set or both have a tendency to instability. And this is increased by further amplification, the common coupling due to the use of the same batteries, or some similar factor.

If it is realised that every H.T. supply, whether battery or mains unit, has internal resistance, it will readily be appreciated that to connect an amplifier across that resistance will result in a certain degree of resistance coupling between the two circuits, and thus instability may be evidenced which neither circuit would show alone. If you have in mind a particular instance and you let us know what amplifier is to be used with what set, and what batteries, etc., are to be employed, we shall be pleased to give you the benefit of our experience in estimatin. whether such an arrangement would or would not be free from instability.

## WHAT DO *YOU* THINK ABOUT THIS?

**A Southend-on-Sea reader altered his old portable set to capacity-controlled reaction by inserting a choke and joining a small variable condenser between the old reaction coil and filament. But found no reaction effects at all when the condenser was rotated—until he discovered an easily-made mistake in the wiring. Can you guess**

**WHAT WAS WRONG?**

**N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to above next week.)**

*The fault that puzzled the Small Heath listener—as described last week—was found to be due to the aerial swinging and touching an iron gutter-pipe close to the landing window.*

### A LOSS IN SELECTIVITY.

C. L. A. (Eltham, Kent).—"I am up against a curious trouble with an H.F. det. and L.F. set, with which perhaps you can help me. I first built a set on these lines just a year ago and it was so successful that I made another one exactly like it.

"Both of these were excellent for long-distance reception, and also the quality was everything that could be desired on the speaker, so that I was not surprised when another friend asked me to build one for him. He had the cabinet and some of the parts, and although the cabinet was a different size from that I had previously used it appeared to be ample for the purpose, and I readily undertook to build him a set of the same design as the other.

"When finished, for some reason, it lacked selectivity. It was quite as good as the others for purity of tone, and I think it is quite as good for long distance, but the trouble is that the two London stations spread so far that it is impossible to give the set a really thorough try-out for foreigners anywhere near their wave-lengths.

"Both the other sets were based on exactly the same circuit, they are still working, and this trouble does not arise with either of them. The wiring, although slightly different, is very much on the same lines, and is followed as closely as possible in building this one. What could possibly cause this lack of selectivity?"

There are so many causes that really it is quite difficult to list them all, for "selectivity" is not a simple property like, say, resistance, but is the product of a number of factors in the design of the receiver, its situation, the aerial and earth to which it is attached, the workmanship put into it, and the material used.

Although you have followed the same circuit in all the three cases the fact that different aerials and earths are probably being used, different components, and possibly a slip in workmanship, would easily account for a difference between this set and the others.

We think the best thing to do is to indicate the common causes of such a loss of selectivity so that you will know where to look for the fault:

Incorrect spacing around coils;
Long grid and anode wires;
Poor contacts and low quality insulation;
Inefficient coils, and
Badly placed screening

are some of the commonest causes.

In addition, you must watch for a badly-placed or badly-constructed aerial-earth circuit, imperfect aerial insulation, spacing of tuning coils from screens, etc., and the degree of coupling, especially between the aerial primary and grid secondary.

### S.G. CONNECTIONS.

A. P. T. (Portsmouth).—"I cannot get my S.G. H.F. amplifier to work. The circuit was given to me by an acquaintance, who has a set like mine, and he got wonderful results with it. I have not actually seen his set, but he told me the dimensions of the cabinet for the unit and sent me a theoretical circuit to wire up.

"I am enclosing this, and also the layout, as I have got it wired in practice. Why is it that it will not work?"

Your trouble is due to the fact that you have confused the screening grid and the plate terminal of the S.G. valve. As you know, the anode output from the *ordinary* three-electrode valve comes from the *plate* pin (which is opposite the grid pin on the valve holder). The S.G. valve has a screened grid as well as the ordinary grid, and it also has an extra terminal on the top of the valve. You have wired up on the assumption that the extra terminal on the top of the valve is connected internally to the extra grid of the valve. That is wrong.

The *screen* of an S.G. valve is connected to that pin opposite to the ordinary grid pin, but you have treated this P or A valve-pin on the valve as its output. To put matters right you must disconnect the wiring which is at present joined to the plate terminal of the S.G. valve holder, and take it instead, by means of a flexible lead, to the terminal on the top of the S.G. valve.

The wire at present attached to this should be undone, and taken instead to the P terminal on the valve holder, and when you have changed over in this way the arrangement you have submitted should work well.

### WAS IT THE CHOKE?

R. S. F. (Cumberland),—"The set is a straightforward detector and low-frequency, and gives good results on ordinary wave-lengths. Reaction is rather like the Reinartz, but both the variable tuning condenser and the reaction condenser have their moving plates connected to earth, which I believe is known as the Schnell-Reinartz circuit.

In the plate of the detector valve is the primary of the L.F. transformer, with an H.F. choke mounted between primary and reaction coil. When I take the set down to short waves I get threshold howl, and I have tried practically everything I have heard of to stop this except a new H.F. choke. Would that be likely to affect threshold howl?"

Yes. It is important to use a suitable H.F. choke and we should certainly try another, or, if necessary, two connected in series.

If you have to resort to the latter expedient, don't forget that there is a strong magnetic field around an H.F. choke, so chokes wired in series should be spaced well away from each other, and from other components.

### ADJUSTING THE "NEUT."

L. M. (Grimsby).—"As it will be run from batteries I have decided to use a neutralised H.F. stage instead of an S.G. valve, and, having a spare H.F. valve on hand, I knocked it up over the week-end. It is extremely sensitive, in fact, a bit too lively, and I am afraid I have not neutralised it properly. What is the best way of doing this?"

The following method of neutralising is recommended for use in sets employing one stage of H.F., and provided with a reaction control.

(*Continued on page* 246.)

## CAN WE HELP YOU WITH YOUR SET?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Steret, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made by 'phone, or in person at Fleetway House or Tallis House.

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# RADIOTORIAL QUESTIONS AND ANSWERS

*(Continued from page 244.)*

First, set the reaction control at minimum and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are "in step" with each other it will probably be found that the set is oscillating.

(To test for oscillation, touch one or other of the sets of plates of the tuning condensers—that may be either the fixed or moving, according to the particular set.) You will probably find that the set will only oscillate, under the above conditions, when the two circuits are in tune with each other, and this can be used as an indication. It is convenient to perform the operation at some point near the middle of the tuning range.

Next, increase the capacity of the neutralising condenser. (In the case of such condensers as the Gambrell "Neutrovernia," this means screwing downwards.)

Test at intervals for oscillation, as this is done, and you will presently find that the set has ceased to oscillate and will not recommence, even when the tuning dials are slightly readjusted. Now, increase the reaction a little, until the set once more oscillates, and again increase the neutralising condenser setting until oscillation ceases.

Slightly readjust the tuning condensers again, to make sure that the set is completely stable once more. Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been "over-shot."

Once this point has been passed it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation but cause it to become stronger. The object is to find such an adjustment of the neutralising condenser as will permit the greatest setting of the reaction condenser to be used without producing oscillation.

It will then be observed that when the two tuned circuits are in step and the set is brought to the verge of oscillation, a slight movement in either direction of the neutrodyne condenser will cause the receiver to break into oscillation. This intermediate non-oscillating position is the correct neutralising position.

It is to be understood that in the preceding notes, where a reaction condenser is spoken of, any form of reaction *control* may be understood.

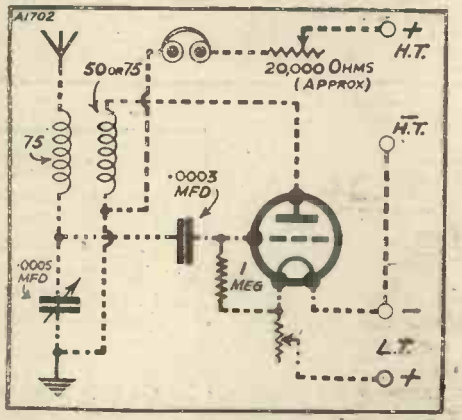
### TROUBLE WITH REACTION.

D. T. (Blackburn)—"What is the matter with reaction when the condenser does not stop oscillating at the point where it started, but has to be taken back about five degrees further?"

This trouble is known as "overlap," and is so called because instead of the reaction condenser dial reading remaining the same for both advancing and retarding reaction, the latter is different from the former, and the critical position for reaction "overlaps" several degrees of the dial.

Common causes are H.T. or L.T. batteries running down, insufficient bypassing or H.F. choking, a high-resistance H.T. supply causing coupling, wrong size of reaction coil, unsuitable detector valve, unsuitable grid leak, and incorrect H.T. on the detector.

## POPULAR "WIRELETS" No. 9




The dotted lines show the connections of the 1-valve "Chitos," the "components" for which were given in last week's Wirelet.

The circuit is both sensitive and powerful when reaction is properly handled, but can cause interference if unskilfully operated.

### PENTODE CONNECTIONS.

E. G. (Johannesburg).—"I am thinking of inserting a pentode instead of the power valve, but do not understand how the two extra connections should be made to it. Where are its extra grids or plates connected?"

The ordinary three-electrode power valve has three internal "doings," namely filament, grid, and plate. The pentode, as its name implies, has five, but of the two extra ones you need only take account of one, because connection to the other is made internally by the makers of the valve.

The relative position of the different electrodes is unaltered so far as the pins on the valves go, so the grid socket on the valve-holder will still correspond with the grid of the pentode, and the plate socket with its plate. The pentode, however, has one extra terminal (which is connected internally to the screening grid), and this terminal must be supplied with an H.T. positive voltage, generally the same as that on the plate of the valve. If the voltage required is the same, you can simply connect the extra terminal to the plate terminal on the valve holder.

If a somewhat different voltage is required for the screen, all you need is a flex lead from this extra terminal to a plug on the H.T. battery or mains unit.

### HAD HE PAID?

A week or two ago we mentioned in these columns the case of a Falmouth listener who made a set for his fiancée, tested it at home and found it worked splendidly, fitted it up with nice leads, spade tags, etc., proudly installed it at his fiancée's house, and switched on. It wouldn't work!

Everything looked all right—the valves lit, aerial and earth were O.K.—but yet there was not a sound in the speaker!

Readers were asked what was wrong, and the following week the real explanation was given. (It was a case of reversed H.T. leads.)

But a Wedmore (Somerset) reader—with a sense of humour—sent the Editor a postcard saying: "What was wrong? Perfectly obvious! His fiancée's father hadn't paid the meter-rent for the last quarter, and consequently the eliminator would not function!"


THE NEW "PORTABLE" COMBINED D.C. UNIT (H.T. with L.T. CHARGER)

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*Patent Applied For*

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H.T. TAPPINGS. Two Continuously Variable & One Power.

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L.T. OUTPUT. A specially constructed adaptor is provided which allows the use of an ordinary electric lamp for charging the accumulator. This lamp may be used at the same time for lighting purposes, without any alteration whatever to existing wiring.

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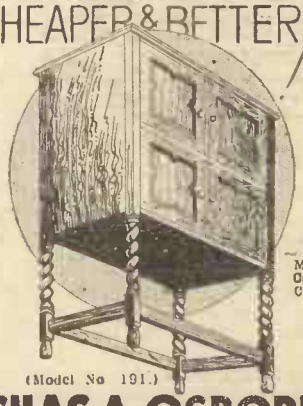

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Super DETECTOR

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IMPEX ELECTRICAL LTD.,
Dept. B, 538, High Rd., Leytonstone,
London, E.11.

# FOR THE LISTENER.

*(Continued from page 226.)*

**Technique.**

An ugly, useful word! Sir John Reith was speaking about the "technique" of broadcasting talks. I don't think there's much in it.

Sir Oliver Lodge broadcasts perfectly, but I don't think technique bothers him. Sir Alfred Yarrow, at the first and only time of asking, got well away. It's common sense more than technique.

If a man will talk into the "meat-safe" as easily and naturally as he would across the hearth or a siphon, it's a "go." That's all the technique he wants. Few have it.

**Happiness.**

Mr. Harold Nicolson and Miss Sackville West talked easily and naturally enough in their discussion of Happiness. Their trouble was that they were rambling and discursive and vague in their minds. It sounded jolly; but the success of these broadcast discussions depends upon an appearance of informality which conceals an argument that has been carefully thought out beforehand.

Mr. Nicolson said that Happiness depended upon our ability to adjust ourselves to society, which may mean almost anything. His wife agreed; but not, I think, for any reason except that the time was up!

**St. George's Day.**

Celebrated by a performance of "Henry V" in 17 episodes, some good, others not so good; and, unless you knew the play well, the effect rather ragged. Llewellyn was a success; and so was Kate. But the men on the whole were unhappy in their delivery.

Their voices were too monotonous. Nobody can render the longer speeches in Shakespeare successfully without using a wider range of voice than these actors used.

**Vaudeville.**

Below the mark, lately, I have felt. The weather may have had something to do with it. Layton and Johnstone, in a relay from the Palladium, suffered by an excess of piano, as if the microphone was badly placed. Wish Wynne for once in a way was not at her best in the variation on "The Forty Thieves." Yvette Darnac sang some charming songs charmingly; but Will Hay, usually so irresistible, seemed to be feeling the cold. But he had his bright moments. "If you don't like your baby, why don't you change it?" "Can't. We've used it!"

**Downing Street.**

After the Chancellor's Budget broadcast, it was up to No. 11 Downing Street to do something to take the taste out of our mouths. So we had a pleasant concert given from there by members of the English Covent Garden Company.

I particularly enjoyed the songs of Noel Eadie and Heddle Nash. It was a kind of hors-d'œuvres to Die Meistersingers.

**FORMO-DENSOR PRICES.**

We regret that a printer's error crept into the "Formo" Co.'s advertisement recently. The cost of the Formo-densor Type "H" (·001—·002 mfd.) was given as "2/-" instead of 3/-, which is the correct market price of this well-known component. Types "F," "J" and "G" Formo-densors are all sold at **2/-** each.

# SIR JOHN REITH AND THE TALKS.

*(Continued from page 228.)*

say that it is certainly not because of any fees he gets! We were under the impression that the scale of payment for talks had improved lately. Perhaps, however, that is a little joke of Sir John's!

In concluding his talk, Sir John said: "Please do not think I am apologising for the space the Talks Department claims in programmes. Even if the talks are irritating to some, they are highly interesting and entertaining to others. There is no question as to their justification. This is drawn not merely from conviction but from overwhelming testimony which comes to us directly and indirectly.... And, despite such extraordinary increases in the number of listeners, the number of those who grumble gets less and less."

We ask Sir John to quote figures in this respect. Of what nature is this "overwhelming testimony"? If, as Sir John says, talks are irritating to some but are highly interesting and entertaining to others, can he say whether 50% of the average information he receives about talks indicates that talks are satisfactory to that degree?

**The Listener Must Decide.**

But after all, it is a matter for the broadcast listener to decide; and, in entering into this Talks controversy, we have done so because we receive at this office weekly large numbers of letters expressing dissatisfaction with the Talks and, on an analysis, we have come to the conclusion that, although there is reasonable ground for criticism that the subjects of some of the talks are not of a nature which will make a wide appeal, the main trouble is with their method of presentation and, in short, the lack of appreciation of the psychology of "putting a talk across."

We can only wish that there were more broadcast talkers with the technique of Sir John Reith himself. His recent talk on "Talks" was a little masterpiece of its kind because one felt oneself being persuaded, as one listened to him, not only of his sincerity—and we need no persuading as to that—but of his complete and unassailable case for and on behalf of the Talks Department.

But, reading over his talk after his broadcast, and uninfluenced by his personality, we feel that there is still a considerable need in the Talks Department at Savoy Hill for a more complete understanding of the value of the recipe which we have quoted in this article.

**NEXT WEEK**

Look out for the "P.W."

**"SAFE-POWER" SUPER**

The last word in D.C. Mains Units for H.T. Supply.

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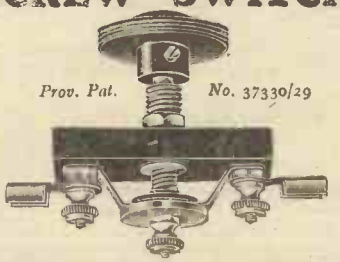

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# TECHNICAL NOTES.

**By Dr. J. H. T. ROBERTS, F. Inst. P.**

### Pick-up Troubles.

MANY readers seem to have experienced trouble from the resonance or natural frequency response of pick-ups. Unfortunately it is not easy to suggest how this trouble can be avoided unless, of course, a different type of pick-up is used.

As you know, the pick-up acts in a similar way to the ordinary soundbox, in that a part of it, called the "armature," is set into vibration by the action of the record moving under the needle.

In the case of the pick-up the vibrations of this armature induce electro-magnetic effects in the windings and these effects are amplified in the receiver and reproduced in the loudspeaker.

### Resonance.

But although the amplification is electrical, we have to deal in the first instance with mechanical vibrations. Any vibratory system must have a natural resonance-frequency which depends partly upon the mass of the vibrating part and partly upon the restoring force which tends to put back the vibrating part into its zero or mean position when it is displaced.

If the restoring force is considerable (that is, if the action is "stiff," to use a more popular phrase) the natural frequency will be higher.

### Uniform Response.

Of course, many attempts have been made to design the pick-up in such a way that the natural resonance occurs at a frequency which is either above or below the frequency range which it is desired to reproduce.

If the natural frequency is well outside this range, then the response over the actual required range may be sufficiently uniform for practical purposes; there will not be, at any rate, marked "peaks" of response occurring within that range.

Generally it is easier to design the pick-up so that the natural frequency occurs at a point considerably *above* the required frequency range.

### Record Wear.

This can be done in one of two ways, either by increasing the restoring force, that is, by making the armature more difficult to shift from its main position, or by reducing the mass of the armature to the smallest possible amount.

If the movement of the armature is made very stiff, then obviously there is extra reaction upon the record and it means, in fact, that the sensitivity of the pick-up will tend to be reduced whilst the wear and tear upon the record will be increased, both of which effects are undesirable.

On the other hand, if the mass of the armature be reduced, this does not impose any further load upon the record; in fact, it has the opposite effect.

This method, therefore, is much the better one for getting a high natural frequency of the vibratory system of the pick-up.

*(Continued on next page.)*


# All O.K.!

I am taking this opportunity to thank you for the "Magic" Four kit of parts which arrived all O.K. I built the receiver and had perfectly marvellous results. Speech and music were wonderful, and in a little over a quarter of an hour I had logged more than 20 stations.

Again I thank you.
Yours faithfully
T. O'R.

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**THE LEYTON BATTERY CO., 305, Church Road, Leyton, E.10**

# TECHNICAL NOTES.

(*Continued from previous page.*)

**The Needle Armature.**

It is for this reason that pick-ups have recently been designed with the so-called "needle armature," in which the needle and its necessary holder together constitute the armature.

Some remarkably good results can now be obtained with the needle-armature type of pick-up, and this seems to be quite a step in the right direction.

With some of the older types of pick-up the natural resonance occurs even so low as around a frequency of 2,000; to be clear of the desired range the natural frequency should be very much higher than this.

It is true that the principal speech frequencies are considerably lower even than 2,000, but at the same time there are many higher frequencies which enter into speech sounds, and still more into the sounds from certain types of musical instruments, which have an important effect upon the quality and which are very much higher than the figure I have mentioned.

## TECHNICAL TWISTERS

**No. 9.**

**LOW FREQUENCY TRANSFORMERS**

**CAN YOU FILL IN THE MISSING LETTERS?**

**Efficient L.F. transformers should have . . . . . windings.**

**Usually the primary winding has . . . . . turns than the . . . . . .**

**The object of the core is to increase the . . . . . interlinkage.**

**It is often advantageous to . . . . . the shroud of an L.F. transformer.**

**L.F. transformers should usually be well . . . . . from other components, to avoid . . . . . .**

**Last week's missing words (in order) were :—Volts, Amperes, Ohms; Two, Third; Ohms, Volts, Amperes; Amperes, Volts, Resistance, Ohms.**

**L.F. Howls.**

I frequently receive inquiries from readers of these Notes with regard to the cause and cure of low-frequency howls, and as these noises may proceed from various causes, it is not possible to say what the cause may be without knowing the circumstances of any particular case.

A plan which is generally recommended in cases of this kind is to reverse the connections to one of the windings of an L.F. transformer, but as a matter of fact this is often not successful.

A common cause of the howl or squeak is undue resistance in the H.T. battery or the H.T. supply unit, and this should properly be overcome by the use of a large capacity bypass condenser.

**Hit and Miss.**

The reversing of the connections to the low-frequency transformer sometimes has a damping effect—I call it "damping" effect for want of a better term—which may achieve the desired result, but it is really

(*Continued on next page.*)

**2/6 THE DOMINION VERNIER DIAL**

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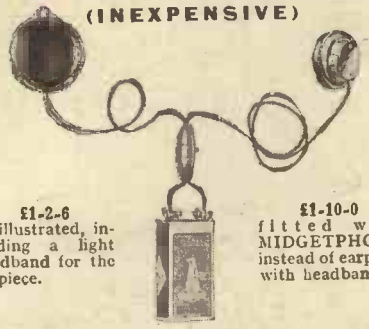
# DEAF AIDS

(INEXPENSIVE)



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# TECHNICAL NOTES.

(*Continued from previous page.*)

only a hit-and-miss method at best and is not really reliable.

A better method is to use a choke-capacity output, which will generally have the effect of keeping the high-tension supply circuit sufficiently free from L.F. currents to prevent the trouble in question.

### Adjusting Volume.

We all know the importance of keeping variable resistance elements clean and free from grit or dirt, which may get between the element and the sliding contact and so cause irregularities and trouble. This is bad enough in all types of variable resistance, but it becomes particularly important in the case of the resistance used for volume control in connection with a loudspeaker.

When you bear in mind that a resistance of thousands of ohms is sometimes required for distortionless volume control and that an amplification of thousands of times may take place before the loudspeaker is reached, it stands to reason that the slightest uncertainty of contact in the volume control may cause tremendous noises in the speaker.

Many sets produce sounds like thunder whenever the volume control is adjusted. In the case of pressure variation (that is, non-wire resistance devices) noises may arise from uncertain or poor contact in the resistance materials employed.

By enclosing the wire windings and the contact member in a suitable cover, dust and dirt are kept out and, as these are the most common causes of noises in this particular connection, the best types of volume control are now enclosed so that dust and dirt cannot reach the working parts.

### Communal Receivers.

I mentioned some time ago the American system for providing radio reception for a block of flats or "apartment houses," and described how this was accomplished in a very simple way with a minimum of expense and without any interference of the various occupants one with another.

It is interesting to note that a similar arrangement is now being installed in a large block of flats in the West End of London. The master set has four valves, and the output of this set provides a comparatively small signal input (equivalent to that from a good aerial) to each of the flats in the building.

This signal input is then amplified in the usual way by means of a local amplifier in each flat. The total number of valves used throughout the building in the various local amplifiers runs, of course, into many dozens.

The flats are fitted up with "points" to which the local amplifier can be connected. These are exactly similar to electric light or power points. The loudspeaker volume can be controlled by the individual users.

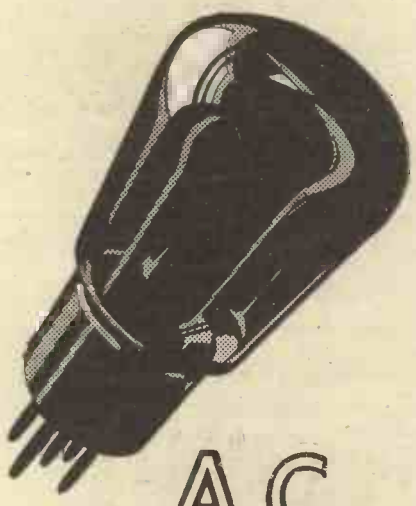
### One Programme at a Time.

The master set is capable of receiving practically any European station but, owing to the fact that a single set is used, it means that all the tenants in the building must have the one programme at a time.

Of course, there is nothing in all this to prevent tenants from having their own sets

(*Continued on next page.*)


# YOUR DEALER HAS THEM—



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# TECHNICAL NOTES.

*(Continued from previous page.)*

for reception, either in addition to, or instead of, the broadcast provided throughout the building. It has been found by actual tests that individual sets in the flats do not suffer in any way from the proximity of the leads connected with the master set.

A similar system is being adopted now in a number of large hotels, and arrangements are being made for two or even more programmes to be "on tap" at a time, the leads being connected through to the various bedrooms and sitting-rooms.

**Important Components.**

You would scarcely think there was much opportunity for research and development work in connection with such an apparently simple thing as a variable resistance of the type used in a radio set.

Some of the leading manufacturers, however, and particularly one well-known company with an international trade, have devoted quite a large amount of attention to this type of component and have brought out various models to meet every conceivable requirement.

**Line-Voltage Control.**

One of the most interesting of these is the ballast or automatic line-voltage control, which provides a variable resistance in the circuit, this being automatically adapted or adjusted according to fluctuations in the mains voltage.

Thus, when the line-voltage is high, more resistence is automatically introduced into the circuit; whilst when the line-voltage drops to normal the resistance is automatically reduced. In this way the actual voltage applied to the apparatus is kept more or less constant.

This type of automatic or ballast resistance is particularly useful when A.C. valves are used in a set, heated of course from the low-tension winding of a step-down transformer. If the voltage varies appreciably this affects the sensitivity, volume, and tone of the radio set, and consequently it is very important to keep the current supplied to the valves as nearly as possible constant.

**Dual Control.**

Another interesting type of variable resistance is the dual resistance, in which two variable resistance elements are used in tandem, operated by a single control.

Any desired combination of resistance values can be obtained over a very wide range, say from 100 ohms up to 50,000 ohms, and one resistance may be decreased whilst another is increased, or the two resistances may be increased or decreased together.

Amongst the various uses for dual resistance control are such combined functions as aerial and grid-bias control, screen grid potential and grid bias, shunting aerial earth circuit and varying screen grid potential, shunting aerial earth and varying grid bias, shunting aerial earth circuit and shunting the secondary of the first L.F. transformer, maintaining constant impedance in multiple speaker circuits and, finally, matching loudspeaker impedances,


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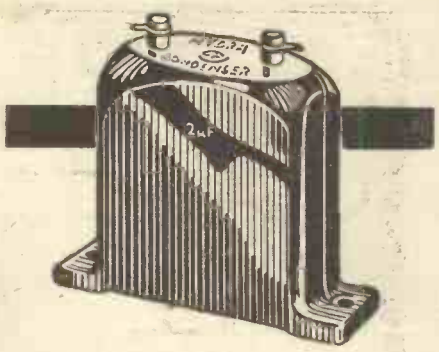

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Connect the Belling-Lee "Spadenser" to your aerial lead. In every case it will greatly increase the selectivity, and in most cases it will entirely eliminate the unwanted station.
This new idea combines a series condenser with a Belling-Lee clip-on Spade Terminal. On occasions when the extra selectivity is not required the "Spadenser" is reversed.
*Write for Belling-Lee Handbook, "Radio Connections"*

*Patent Applied For.*

only 2/6

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FOR EVERY RADIO CONNECTION

*Advertisement of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex.*

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# THE "STAR-TURN" THREE

This Super Set, at a staggeringly low price, contains a wonderful new tuning circuit, and is extremely simple to build and operate. It is amazingly selective, so that you have no trouble from interference from your local, while it will pull in stations by the score.

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The "STAR-TURN" THREE is fully described in

**The MAY**

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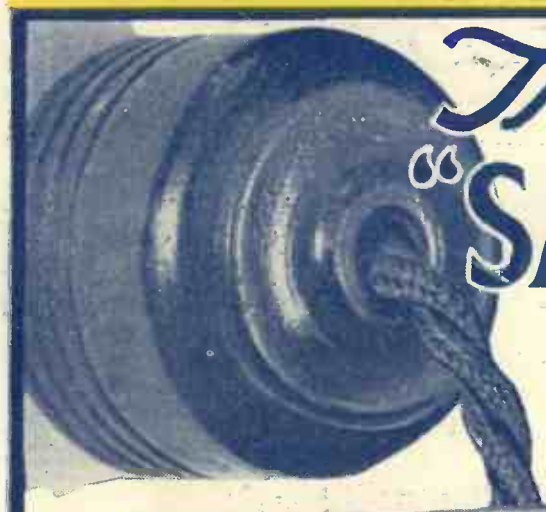

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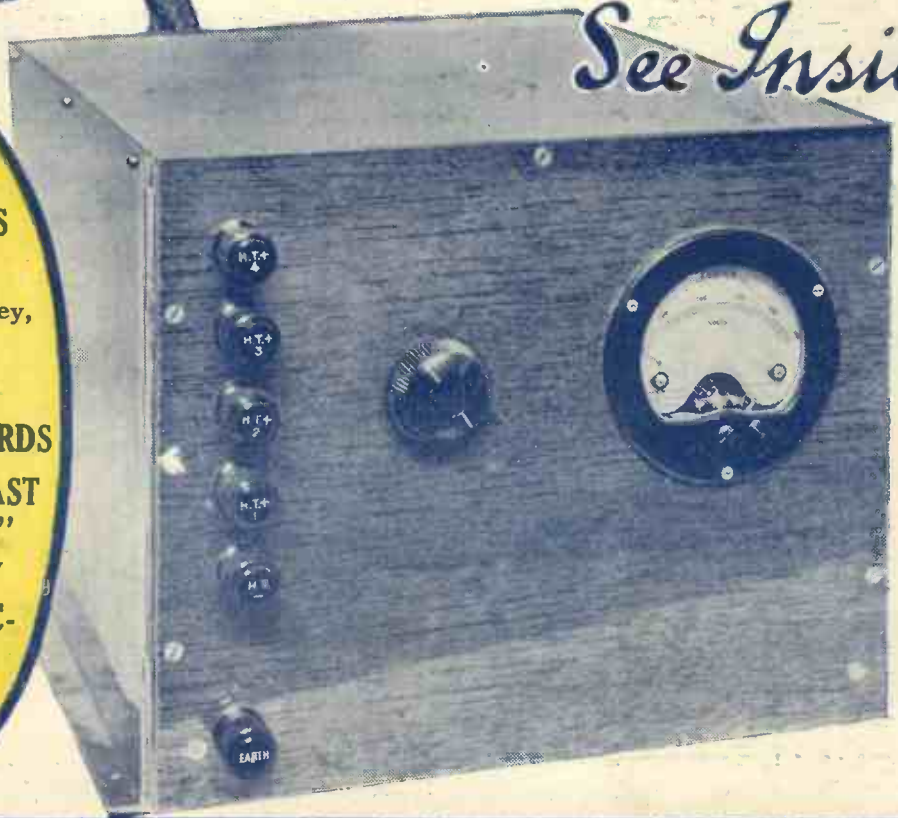


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THE LEWCOS REJECTOR WAVETRAP IS SUITABLE FOR EITHER CRYSTAL OR VALVE SET.

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## RADIO NOTES & NEWS

**RADIO WINS.**
**NEWS FROM PESHAWAR.**
**A STAR ISSUE.**
**SPACE AND TIME.**

### Beginning to Flutter.

MY wings are beginning to flap because very soon I am going to disappear from the ken of all except innkeepers. Officially, we will say that I am to inspect aerials in the Cotswolds; really, I am going to tramp about in dreadful boots and make friends with meditative kine. I never yet saw the pedestrian who had the hardihood to carry a radio set in his kit; very handy, but its room is to be preferred to its company and weight. Therefore, farewell, a long farewell to the ether. For me, the mundane sounds of wind, woods and —most probably—rain.

### "Direct Action."

IT is difficult to suggest any greater source of provocation, of the minor sort, than the task of having to listen-in for several hours, to the "howls" from the set of a neighbour with more zeal than knowledge. Nevertheless, the action of a man living at Ardwick-le-Street, who just took an axe and chopped down his neighbour's aerial pole because of "howls," strikes one as pure barbarism. And yet there is an inner voice which applauds it. So direct and efficacious! He is to pay costs and repair the damage, but I'll wager he does so with a light heart. That little play with the axe did him a world of good. (Oh, Ariel! You dreadful man!)

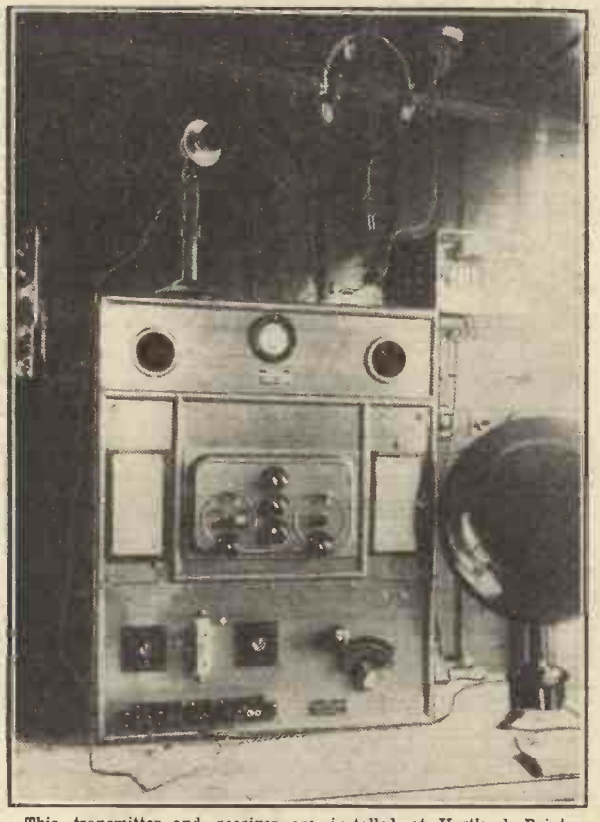
### Modern Marvels.

RADIO-TELEPHONE services are now cropping up all over the world and not the least wonderful of these is that between Great Britain and Australia. Not until you have travelled between the two countries can you appreciate fully how this service has abolished distance. Somewhat more attractive, because of its novelty, was the recent demonstration of telephony, when someone in London held a radio conversation with a person who was seated in a Canadian train travelling at 60 miles an hour. Is it possible for scientists to astonish us nowadays?

### What Causes "Sulphating?"

I THINK that many readers of my first note under this title were just a shade too eager to correct me, though I testify that most of them administered the dose in the sweetest possible manner. I have received quotations galore from books, torn-out pages of makers' instructions and treatises on the chemistry of primary cells, but in nearly every instance the subject of the sermon has been *under-charging*. Now, who said anything about *under-charging?*

## LUNDY ISLAND'S LINK WITH LAND.



This transmitter and receiver are installed at Hartland Point, N. Devon, to keep Lundy Island in touch with the mainland. The owner of the Island, Mr. Harman, runs a similar set on Lundy.

Not I! My note was about the *rate* of charging; charging at a low rate may be wicked, but it is certainly not the same as undercharging, is it?

### Trickle Chargers.

THERE does, however, appear to be a general belief that chronic charging at a rate less than the normal eventually "sulphates" the cell, and I regret to infer that "trickle chargers" are, therefore, not the unmixed blessings one has imagined them to be. Conscientious research in the interests of science and "P.W." finally rewarded me with the sight of a battery which has been "trickle-charged" for two years, and which showed a *white* deposit on the floor of its container. No doubt of it—sulphate!

### Iceland to Join Up.

THE latest convert to the way of radio is Iceland, fabled island of "Eric Brighteyes." At present connected to the Shetlands by a cable, Iceland plans to link itself up with the world's radio system, both telegraph and telephone, and to discard the cable link. Good luck to the hardy Norsemen, and may we have many a relay of Icelandic programmes.

### Eliminating "Hum."

J. M. S. (Thornby) says that he has eliminated "hum" by connecting the primary winding of a discarded transformer, in the negative mains (D.C.) lead, between the lamp socket and his eliminator, "in series," of course. Very sound idea! But let us not overlook the fallacy which lurks around it. The introduction of inductance into the negative lead of a D.C. supply provides "smoothing;" it is true; but all the smoothing is supposed to be provided by the "eliminator." Hence this transformer dodge is merely a way of supplying something which J. M. S.'s "eliminator" happens to be short of, and it does not introduce any new principle.

### The Theatre at Home?

MR. D. SARNOFF, who has a profound faith that television will develop to a stage in which the reception of images will be as simple and as effective as radio reception is now, predicts that the home theatre of the future will present pictures possessing sound, colour, motion and perspective. If the price is right, the theatres might then just as well shut up. Sarnoff points out that

(*Continued on next page.*)

# NOTES AND NEWS.

*(Continued from previous page.)*

of the 20,000 theatres in the U.S.A., only one half are first-raters, the remainder being second- and third-rate. Well, it may take longer than he thinks, say, 25 years, but when I consider how radio has developed in the past quarter of a century I am loth to say that television will not similarly respond to research. Many scientists are now making a massed attack upon this subject.

### Radio Wins over Conductor.

IN contrast to some well-known musical conductors and artistes, who pretend to feel positively ill at the mere mention of radio—though they are not averse from being "recorded" by gramophone companies—the famous conductor, Leopold Stokowski, is a strong supporter of broadcasting, and has demonstrated the fact by undertaking a course of radio engineering with the object of being better able to advise on the broadcasting of large orchestras. Thus, instead of "crabbing" radio, he is willing to lend his musical genius to the service of broadcasting technique.

### Is This a New Idea?

ON May 20th the Samuel Pepys Commemoration Service, at St. Olave's Church, is to be relayed in the National programme. On June 5th, the ceremony of the unveiling of a monument to the memory of General Wolfe, the hero of Quebec, will be broadcast. As I pondered on these announcements the idea came—"Would not a listener's diary, giving his impressions and emotions, together with comments in general about the speakers, etc., be a most interesting and possibly valuable work in, say, ten or fifteen years?" I present you with the notion and hope that some of you may execute it.

### Sublime to ——?

IT is fairly certain that if the recording angel were to visit Earth an American would try to sell a new pen to him, and even try to interest him in loose-leaf books. Strength is added to this conviction by the news that Americans are petitioning the astronomers to christen the newly-found planet "Arkays." Now, "R.K.O." is short for the "Radio-Keith Orpheum" Circuit of "talkie" theatres. What audacity! However, I consider that the petition is doomed to failure because Mr. Ford is sure to have purchased the new planet already—for a gift to Edison!

### News from Peshawar.

SGT. H. B., writing from far-off Peshawar, 800 miles from Bombay, the nearest broadcasting station, adds his testimony to the increasing chorus from overseas, which clamours for a good British short-wave station. He points out, as so many others have done, that the excellence of certain foreign S.W. stations render their proprietors' names household words. Of course! And so far as my information goes, the B.B.C.'s sole idea in extending the use of 5 S W is to issue news bulletins!

### A "Star" Issue.

IN the words of the newspaper placards when they refer to Jack Hobbs or Carnera. "Modern Wireless" has "done it again." I picked up a copy of the May issue, just to glance hurriedly through it, and half an hour later realised with a start that I was absolutely embedded in the thing. Complete descriptions are given of the "Star-Turn" Three, the "Iso-Tune" Two, the Regional Amplifier, the "Tune-All" Four, and the "M.W." "Cornacone." In addition this number contains articles by Sir J. Reith, Capt. P. P. Eckersley, the Hon. J. M. Kenworthy, R.N., M.P. and numerous other popular contributors. And I must not forget the fascinating new feature, "The World's Programmes," a condensed and helpful feature all about, "When, Where and How to hear Those Foreigners."

## SHORT WAVES.

The sleep we get before midnight does us most good, says a doctor. Still, the B.B.C. needn't carry the idea too far.—"Daily Herald."

* * *

"A portable amplifying set costing £350 will provide music in Ilford parks in the summer," we read in the "Sunday Express." A most novel way of settling the question of congestion in London's open spaces.

* * *

"Is your set stable?" runs a headling in the "Wireless Constructor." We don't know; but it's certainly a little "hoarse."

* * *

Boko was a member of the monkey house at the Edinburgh Zoo, and a popular unit of the Children's Radio Circle. Now he is no more. It would be invidious to suggest the obvious person to fill his place.—"Vox."

* * *

"Do you think people who listen-in to their loud speakers on Sundays can expect to go to heaven?" "Well, they might; but I'm afraid they'd be risking their next-door neighbour's chances."

* * *

"If gramophones were confiscated, and the B.B.C. shut up for the holidays, I wonder what our reaction would be," we read in the "North Eastern Daily Gazette." Some suggestions put forward for filling up spare time are flute and cornet practice, piano playing, or filling up one's income-tax form!

* *

**RADIO TRAGEDY.**

I once was a Radio Fan,
And I lost my heart to a man
Who sang very exquisitlee,
"O, for the Wings of a Bee!"

When he sang in the evening-tide,
"Alice, Where Art Thon?" I cried;
His voice was so youthful and clear.
I answered, "Thine Alice is here!"

But quick to extingnish the flame,
The "Wireless Weekly" came,
And, with a dull, horrified stare,
I beheld my love's photograph there!

My set no more "Hullos" will call.
I don't read your paper at all;
And I hate to remember, young man,
That I once was a radio fan.

"Wireless Weekly."

### A Mighty Industry.

THE figures which are quoted from the U.S.A. Department of Commerce statements are large enough to drive a British trader crazy with envy, I should think. Just fancy! The huge aggregate business of 135,845,635 dollars was reported for 1929 by 10,455 dealers, and these dealers are only about a quarter of the total number at work in the U.S.A.

Between them they sold 862,599 "mains" sets and 35,197 battery-driven sets. Shows which way the wind blows, doesn't it?

### Long-Distance Ship Telegraphy.

WIRELESS pioneers dating back to the days when for a ship to communicate with the shore over a distance of several hundred miles was considered excellent work, will revel in the news that Prince Purachatra of Siam, while returning home from Europe, carried with him in the M.S. "Fionia" a British-made short-wave transmitter and receiver and was enabled with these to maintain contact with Bangkok from the Red Sea all the way to Siam, some 4,000 miles. The set has an input of only 100 watts and works on the 40-60 metres band.

### Acknowledged.

WILL F.J.G. (Birmingham), A.C. (Northfleet), C.A.J. (Harlesden), G.A.M. (Wakefield), A.G. (Huddersfield), S.H.J. (Hornchurch), and C.A.B.) Burton-on-Trent) kindly accept our thanks for their letters which, although of great interest to all and sundry here, do not lend themselves for publication or for comment in these Notes.

We thank also the gentleman who explained how the world is going to end on July 17th and him who sent us the wire puzzle—or was it meant for a patent coil? Anyhow, the office-boy says that he "did" it in six minutes!

### Conquest of Space and Time.

AS a test of what cable and radio telegraphy can do the Associated Press of America sent a message which went round the world twice in 2 hours 5 minutes, including the time for stops during which it was copied and relayed at 22 important news centres.

Nothing but natural thought transference could beat that! And only some 27 years ago, if my memory is not at fault, the "Times" had a leading article to celebrate the publication of its first press message received by wireless from the U.S.A.

### An "All-Mains" Danger.

I HOPE that if you discard batteries, or even the H.T. battery, in favour of the mains, you will not thereafter find yourself in the present position of some Burnley listeners. It is estimated that there are about 8,000 licencees there, 4,000 of whom use battery eliminators on the D.C. supply.

Now the Corporation is going to change the supply to A.C. and the 4,000 luckless ones are asking awkward questions about compensation, of which the Corporation people do not like the sound. They think that if all the D.C. cases were compensated the cost would add another sixpence to the local rates.

### Broadcasting Items.

PORTUGAL, having no broadcasting stations to maintain, has generously decreed that its people may listen in—to other countries—free of tax, provided their aerials do not cross roads and other public property.

The Indian Government has undertaken to pay about £22,500 for the Indian Broadcasting Company. Pity, in view of what is happening, that they didn't boom broadcasting years ago, tax or no tax.

It is reported that in Luxembourg a new law has been made, under which private persons may erect transmitting stations. Let us hope this applies only to low-power "amateurs."

**ARIEL.**

# FADING

## by Capt. P. P. Eckersley M.I.E.E.

## PART I.

AT one time or another we have all listened to programmes emanating from far-away stations. If we have been allowed to listen to a station for more than a few minutes we have been likely to notice that, without the receiver being touched, the strength of reception dies away slowly to almost zero. During this "fade" the quality all goes bad and is almost unrecognisable as music or speech. This phenomenon is called "fading."

**Every long-distance listener will be interested in this subject, which, as dealt with by "P.W.'s" Chief Radio Consultant, is extremely fascinating.**

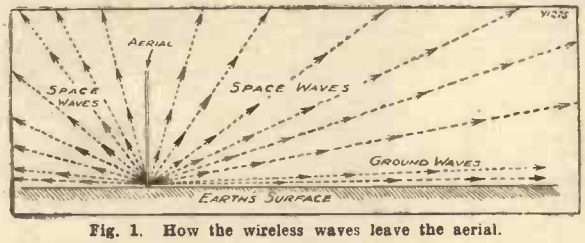



**Fig. 1. How the wireless waves leave the aerial.**

My attempt in this article is to give you a picture of what happens when "a distant station fades."

Look at Fig. 1. The horizontal line is supposed to represent the earth's surface. The vertical line is a representation of a transmitting aerial. The angular dotted lines are intended to represent the paths of rays of electric waves being sent out from the aerial when it is energised by high-frequency currents.

### "Ground" and "Space" Waves.

Certain waves travel along the ground; certain waves fly upwards and outwards into space. We call the former "ground" waves or "direct" waves, the latter "space" waves or "indirect" waves.

The ground wave meets with all kinds of obstacles to its progress. It must, as it travels, step on trees and houses and telephone wires, it must find its way over hills and forests, over mountains and lakes. In doing so it loses energy and gets tired more rapidly than if the earth's surface were, to it, perfectly smooth.

The shorter the wave-length the shorter, as it were, its steps, and the more frequently it gets entangled with earth surface obstacles. A child with tiny tottering steps finds a soft carpet enough to tire it, the bigger man walks over the carpet unnoticing its irregularities, but tires himself on ploughed land.

The seven league boots of the fairy story took such long strides that its owner laughed even at mountains. The longer the step the less irregularities matter, and so the longer the wave-length of the electric wave the less it loses energy in moving away from its starting point.

Two waves, one of length 2,000 metres, the other of 200 metres, may start with the same strength, but at 50 miles, having passed over ordinary English country, the longer wave may be 20 times the strength of the shorter. The shorter may die out nearly completely at 50 miles, the longer may still be appre-

*Continued on next page.*)

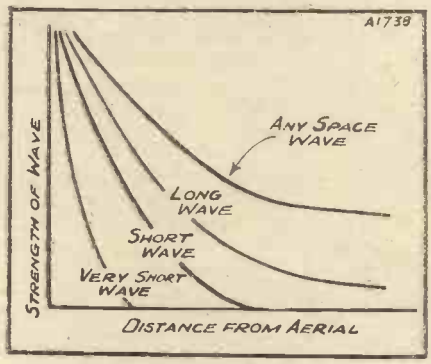
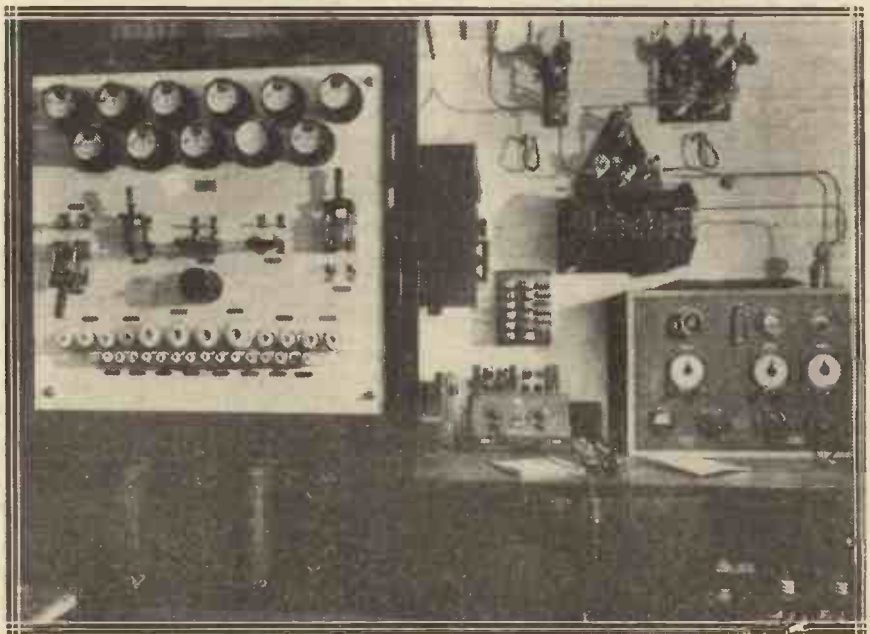



**Fig. 2. Showing relative strengths.**

## WIRELESS AND THE MODERN LINER



Some of the radio gear on the German liner "Europa," which has a magnificent wireless installation.

## FADING.

*(Continued from previous page.)*

ciable at 500 miles. So much for the ground ray. It dies away in strength as it moves away from the aerial. It dies away much more quickly as its wavelength lessens. Any ground wave dies away more rapidly if the earth over which it travels is " broken," i.e. mountainous or hilly.

But what of the space ray, the rays shot off at an angle to the earth's surface? Obviously these do not fret themselves against any material object, and they only die away like all energy dies away according to an inverse distance law. (Note: even though the space waves do not lose energy by contact with material things they do get feebler as they get farther away. To make this clear by example if not by explanation: there is practically no matter between us and the sun, but we don't get the full radiant heat of the sun, nor should we even if there were no atmosphere.)

### How Intensity Varies.

The point to appreciate is that the space waves die away very slowly compared with the ground wave. But the space waves, not having their feet on the ground, as it were, die away at a rate independent of wavelength; it does not matter if the wavelength is short or long when the waves do not touch any material objects.

To make this abundantly clear, see Fig. 2 with curves, which show the intensity of waves at different distances. The upper curve shows the intensity of the space waves at distances measured along the ray, the lower three curves show the intensity of the ground wave at distances measured along the ground.

Now what happens to those strong space rays? Do they eventually entertain the beings on another planet? No! They don't, so we can keep our shame to ourselves.

There is supposed to be above the surface of the earth an electrified layer called the Heaviside Layer. Never mind what it is at present, but imagine " the inverted bowl we call the sky " is really composed of myriads of billions of myriads—and so on—of little electrically-charged particles.

The space waves shoot off at an angle to the earth's surface, and they must then come in contact with the underside of the bowl. The bowl reflects them down again: (once more I have no space to explain how, please take it that it just does).

So really we have a state of affairs as shown in Fig. 3. The ground ray A—G goes along the earth and, with a given earth, and a given strength of initial radiation, and a given length of wave, we will say that its strength is sensibly zero at G, gaining strength as we move from G to A.

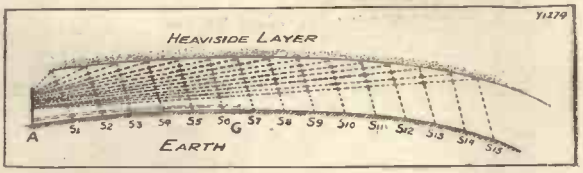



Fig. 3. What happens when the waves meet the Heaviside Layer.

But see the space rays. These reflected down again impinge on the earth at points $S_1$, $S_2$, $S_3$—$S_{15}$. At points $S_{10}$ and $S_{11}$ and $S_{12}$, etc., however, they can be much stronger than the ground ray; they are far from zero strength because they have not wasted their energy on the ground, and have only wasted a little in being turned back earthwards again, at the inner surface of the Layer.

At points $S_6$, $S_7$, $S_8$, etc., they may be assumed to be about equal in strength to the direct ray. At points $S_1$, $S_2$, etc., they are much feebler than the direct ray, or the direct ray is much stronger than they are.

Now the space rays have travelled over different lengths of paths from that followed by the direct ray. At a point $S_6$, $S_7$, $S_8$, etc., they may therefore at any moment interfere and *annul the direct ray.* On the other hand, due to the ever changing state of the electrified layer, they may at points $S_6$, $S_7$, $S_8$, etc., aid the direct ray. This makes a disturbance momentarily twice as strong as when the direct ray alone operated. So at points $S_6$, $S_7$, $S_8$, etc., we may get very severe fading indeed.

### Always "Shifting."

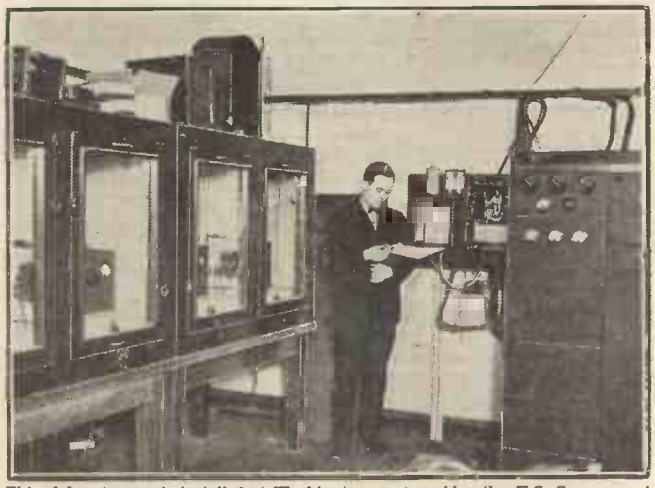
At points $S_1$, $S_2$, etc., the space rays are never strong enough to make much fading effect. At points $S_{12}$, $S_{13}$, $S_{15}$, etc., however, the space rays alone are responsible for the signal, and there is no interference between direct and indirect rays. There is some fading, however, because it must not be thought that the Layeris a fixed and stable mirror for the waves.

It is an uneasy, shifting thing, turning over in its sleep, altering its shape and consistency, and so greatly changing its properties.

The last point to remember is that the Heaviside Layer only forms so far as broadcasting wave-lengths are concerned at night.

I shall continue a discussion of the theory in a further issue.

## UNCLE SAM'S "RADIO-POLICEMAN."



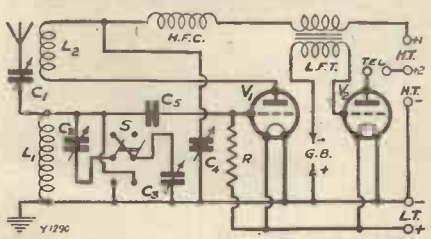
This elaborate gear is installed at Washington, and enables the U.S. Government to keep a watch on radio transmissions and to prevent " wavelength wobbling."

## MY IDEAL SHORT-WAVER.

**By A "P.W." READER.**

THE chief difficulty that anyone who wants to listen to any of the various amateur short-wave bands has to contend with is the fact that a normal short-wave receiver covers these bands in a few degrees of the dials of the tuning condenser. This bunches the stations together, making it hard to separate and read weak signals.

### THE CIRCUIT CHOSEN.




Easy wave-change, ordinary waves as well as short, and ease of control were features regarded as essential.

An attempt was therefore made to construct a receiver which would be capable of:

(1) Use as an ordinary short-wave broadcast receiver.

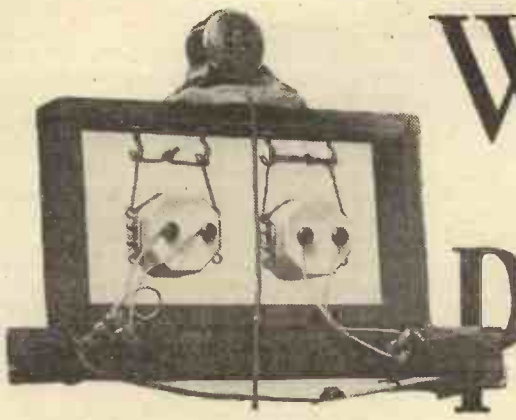
(2) Tuning to any amateur short-wave band, and so spreading the band out that it would cover at least 70 degrees on a 100-degree dial.

(3) The receiver should also be quite easy to operate.

The circuit and tuning table of the set which was eventually constructed to these specifications may be of interest. As will be seen rom the sketch, the circuit is quite straightforward, the only unusual part being the two condensers $C_2$ and $C_3$. By means of a push-pull switch, these condensers may be thrown in series or in parallel. When in series, the total value of the condensers is very small indeed,

The settings for the different bands are shown below:

| Band | $C_1$ | $C_2$ Dial Reading | $C_2$ and $C_3$ in series or par. | Coils Tuning | Reaction |
|---|---|---|---|---|---|
| 10 metre | ¼ in | 30 | Series | 2 | 2 |
| 20 ,, | all in | 30 | ,, | 4 | 6 |
| 40 ,, | ½ in | 30 | ,, | 9 | 6 |
| 80 ,, | All in | 90 | Parallel | 9 | 6 |
| 160 ,, | ,, ,, | 50 | ,, | 30 | 25 |



# WOTTEN BWOADCAST DWONUNCIATION

## BY TOMMY HANDLEY

**This cheery article deals with the rather doleful business of B.B.C. pronunciation in characteristic Tommy Handley style.**

A FAST sports car swished to a standstill, and its languid occupant drawled out a question to the village idiot regarding the signpost.

"Aye, soirrr," said the old man. "Thet be the roiwd, way up over t'ill. But do 'ee come fra' Lunnon, soirrr?"

"Yaas," replied the surprised driver. "Whaa do you say thaat?"

"Well, soirrr. You speak like t'woireless hannouncer!"

And there you have the broadcast English business in a nutshell! As a radio man I am concerned about it. The way in which English will be spoken in England is so tied up with broadcasting that anyone with a nodding friendship with the microphone must feel responsible.

The reason is that for the last seven years radio has been an invader into people's homes, and is having an influence just where any difference such as a difference of speech is most noticeable. It means that folk all over the country are *learning how London speaks*, whereas previously their knowledge of pronunciation was limited to that practised within a circle of about ten miles.

### The Standard Committee.

There is, of course, a standard B.B.C. committee on Broadcast English, and it is a good thing to have when it comes to a question of whether we shall say "awtomobeel" or "ohtomobyle." George Bernard Shaw said recently that the only way to pronounce "automobile" is to call it a motor-car!

*And the joke is that G.B.S. is on the B.B.C.'s committee, and has sanctioned the correct pronunciation of "automobeel"!* So where are we, please?

What the committee can never do, and what it would be difficult for anybody to do, is (a) to bring out a standard language for broadcasting in England; (b) to ensure that the same language is always broadcast; and (c) to arrive at a pronunciation which will please everybody.

### C. B. Cochran's View.

I nearly wept over this thought until, just recently, I heard the well-known producer, C. B. Cochran, talking about good English. He said something to this effect: "Beautiful speech, like charity, begins at home.

"We English should see that our accent and the melody and rhythms of our speech are not corrupted by imitations of popular vaudeville artistes, arbitrary dons, or affected social leaders.

"We must keep our speech simple, remembering that a wireless announcer's 'refaned' influence may be just as dangerous as the nasal squawk of some Lithuanian-Chicago darling of Hollywood, and that the fruity, supercilious drawl of a country parson has only the warrant of false snobbery to back its claim to superiority over the rich tonality of the peasant speech of East Anglia or Gloucestershire."

Personally, I'm very fond of the way Cornish women "sing" their words, I admire the broad Highland tongue, Irish brogue is pleasant, and I can't properly understand Mancunians, yet we all speak what we call "English"—though strictly, I suppose, I speak "London."

If broadcasting will eventually mean the extinction of the pleasing dialects we shall be the worse for it. Though there will always be old villagers anxious to earn stray coins from inquisitive tourists by saying "Aye, aye, soirrr. Thet it be!"

### A "Standard" Inevitable.

In just the same way the fisher-girls on the Dutch coast wear their fancy costumes and "ear-eyes" to please the fashionable bathers at Scheveningen, and walk down Klaverstraat in Amsterdam for the same purpose.

Broadcasting is bound to hasten the arrival of *some* standard kind of pronunciation, no matter how unsatisfactory it is.

It's so difficult to tell who's right and who's wrong. Only the other day I heard it said by a Northern Irishman that the "vulgarisms" of Ulster pronunciation were being attacked. And I was reminded of the fact that a broadcaster from Belfast recently gave a talk in which he said that these "vulgarisms" are part of the history of the English language, and are, in fact, a survival of the English spoken at the court of Queen Elizabeth. In her time words like learn, servant, please, and speak were pronounced "larn," "sarvint," "playse," and "spake."

I think you will notice that, though you may not agree with my pronunciation on all points, I do at least speak English, and not American. I deplore the onslaughts of Broadway, backed up by the advent of the talkies.

### "HULLO, FOLKS!"

Mr. Tommy Handley, the happy-voiced B.B.C. favourite, who writes this article specially for "P.W."

American twang has done more than anything else to make "talkies" unpopular with thinking English people, and the B.B.C. has had a hard task to steer clear of a similar Yankee ramp on the "mike."

The trouble is that while we, and various pronunciation committees, are standing still and asking, "What kind of English shall we broadcast?" the machinery of broadcasting is still going on, and the innocent announcers, who have to say something, say it in their natural tongues. They may be disagreed with, but at least they're understood. And the poor artistes have to do the best they can.

For myself, I am heartened by the fact that a recent talk from London was attacked in letters on the following grounds: (*a*) that it had a Communist bias; (*b*) that it was Fascist propaganda; (*c*) that it was anti-clerical: (*d*) that it was sectarian twaddle; (*e*) that it was frivolous; and (*f*) that it was too highbrow.

Silence is indeed golden now that speech is so slipshod!

### "DO 'EE COME FRA LUNNON?"

Even the village idiot recognises announcer-English!

LATEST BROADCASTING NEWS.

# MRS. PHILIP SNOWDEN AND B.B.C. CHAIRMANSHIP.

## THE NORTHERN "PROMS."—QUEEN'S HALL TOO—THE TEST MATCHES—ETC.

IN view of the fact that Mrs. Philip Snowden is herself a strongly-backed candidate for the post of Chairman of the B.B.C., shortly to become vacant, her views on the essential requirements and conditions of the job are of special interest.

Mrs. Snowden characteristically insists that a salary of £3,000 a year carries with it an obligation to work, not merely to attend rare Board meetings. In her view the chairman should have his own office at Savoy Hill, and be in attendance at least half of every day. Other points in Mrs. Snowden's requirements are as follows:

Chairman should visit stations regularly, and attend advisory committees.

He should be of firm character, above suspicion of bias, and capable of maintaining the balance of opinion and taste with strict fairness.

Automatic retirement at the age of seventy.

### The Northern "Proms."

Both the National and the North Regional transmitters are to broadcast the first of the series of Northern Promenade Concerts which is to be given by the Hallè Orchestra under the conductorship of Sir Hamilton Harty at the Free Trade Hall, Manchester, on Monday May 26th.

The whole programme, of which listeners will hear the first part between 7.45 and 9 p.m., will be orchestral, and will consist entirely of works by Wagner. Part of each of the remaining concerts for the same week will also be broadcast, except that on Wednesday, May 28th.

The concert on Tuesday, May 27th, will be heard by London Regional listeners between 9.15 and 10.15 p.m., when, in addition to the orchestra, there will be items by Jelly d'Aranyi, the well-known violinist, and Reginald Whitehead, the Manchester baritone.

Thursday's concert will be broadcast in its entirety, the first half from the North Regional transmitter and the second half as part of the London programme. Olga Haley (soprano) is the solo artist, and the orchestral pieces include Schubert's Unfinished Symphony and Brahms' Symphony in D, in the first part of the programme, and Dvorak's Fifth Symphony in the second part.

### Queen's Hall Too.

Millions of listeners will welcome the news that the B.B.C. is arranging another season of Promenade Concerts at the Queen's Hall this year. It will last for eight weeks, namely from August 9th to October 4th, and many of the concerts will be broadcast. Sir Henry Wood will, of course, conduct. We shall print further details of the programmes as soon as these are arranged.

### Broadcasting House, Edinburgh.

Work at the new Scottish Broadcasting House at Edinburgh which, as recently announced in these columns, is soon to be the headquarters of broadcasting in Scotland, is proceeding so rapidly that it will not be long before one of the studios is ready for use.

The main studio, however, a roomy affair with a gallery to accommodate an audience, will not be ready for some time yet, neither will the smaller studio, which is to be used for talks and the broadcasting of gramophone records. During the next few weeks the Edinburgh staff will take up their new quarters, but the main body will have to remain in Glasgow for some months.

## NOT A CONJURING TRICK—

—But the "internals" of a Mansbridge type condenser, consisting of tin-foil on a paper strip.

### The Aldershot Tattoo.

The Aldershot Tattoo will be broadcast from the National transmitters on Tuesday evening, June 17th. As in previous years, the relay will be in two sections, the first taking place between 9.45 and 10.20 p.m., and the second between 10.50 and 11.30 p.m. Further details of this broadcast will be published in our columns in due course.

### Two Interesting Announcements.

The song of the nightingale appears as an item in the broadcast programmes during the week between Monday, May 26th, and Saturday, May 31st. It is, of course, impossible to give precise details as so much depends on the state of the weather, which affects the singing of the birds. However, the outside broadcast engineers will be on duty in the woods at Pangbourne, in Berkshire, each night during the week, ready to switch through to the control-room at Savoy Hill at any time between 10.30 p.m. and midnight. The song of the nightingale is now an annual institution in the programmes which few listeners would like to miss.

### For The Old Folks.

Another programme for Old Folks will be given in the Birmingham Studio on Thursday, May 29th. It will begin at 6.40 p.m., a time calculated to be most convenient to those for whom it is intended, and will consist of items by H. G. Crews, and James Coleman, bass.

### The Test Matches.

Arrangements have been made to broadcast eye-witness accounts of the forthcoming Test Matches between England and Australia, it having been decided, as a result of past experience, that cricket does not lend itself to running commentaries. These eye-witness accounts will be given from 6.30 to 6.40 p.m. each day during the progress of the games, and are to be relayed from the actual ground.

# FOR THE LISTENER.

**A Specially Contributed Criticism of Current Broadcasting Events. By "PHILEMON."**

**Who will long be remembered for those wise and witty broadcasts entitled "From My Window."**

### "Peep-Bo-Hemia."

I THOUGHT this was a very good show. Leonard Henry is a host in himself; he seems to be relying less upon his "business" and more upon the wit and humour of his talk, and improves all the time.

There still, however, remains a big gap between the "stars" and the lesser lights. You have to get through a lot of tissue paper before you come to the threepenny-bit! Tommy Handley, the other night, was in a very gay and spring-like humour.

Mr. Helmsley's "Elsie" was as precocious and amusing as ever; and I quite liked Art Fowler with his ukulele solos. Not that I am tired of the old stars, but I should like to see new ones rising; for, after all, the Vaudeville Hour is almost the only entertainment provided for us now!

### The Talking Machine.

As the entertainment barometer falls, the talking barometer rises! It is difficult to keep track of the new series which have been started. "Architecture To-day and To-morrow," "The Study of the Mind," "The Making of a Personality," etc.

Personally I like talks. I like Vernon Bartlett. I am not nearly so frightened about India after hearing him discuss the situation there. He has a very steadying effect, with his clear mind and his quiet voice. I shall also follow very closely the series on "Research and Discovery."

Mr. Gerald Heard, who gives this series, said quite rightly that almost as many people want to know what is going on in the world of science as in the world of books or the cinema. The discovery of a new planet is more exciting than the discovery of a new film star at Hollywood.

### Birds.

This is another series of talks which rather intrigues me—Professor Julian Huxley on "Bird-Watching." I watched a woodpecker the other day boring into a

(*Continued on page* 274.)

# Where Constructors Go Wrong

**The tale of a reader's "Magic" set—and a moral, interestingly related**

**By G. V. DOWDING, Associate I.E.E.**

BEFORE I get down to the main subject of this article, I must say that it is obvious that a lot of constructors don't go wrong at all!

This is proved by the enormous number of "Magic" enthusiasts who really are getting "Magic" results. There can't be much wrong with a three-valver when it manages to pull in over 50 stations on the loudspeaker!

And this is the sort of thing that is happening all over the country.

Now and then we get queries from readers who have met with trouble. Generally, the Queries Department can very quickly put these people on the right track. But sometimes we get a case that does seem almost hopeless.

### He Had "Tried Everything!"

In such circumstances, we often try to borrow the actual set concerned. (But I must hastily point out that we cannot accept uninvited sets.)

And when such a set actually comes along—what a tale it generally has to tell of its builder!

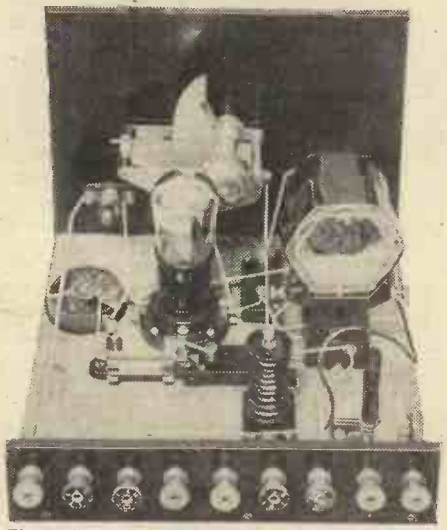
A week or two ago we came across a "Magic" One set that "simply wouldn't work properly," although the owner had "tried everything" and had "rewired the whole set several times."

We reproduce a photo of this particular set on this page, together with a photo of the original "Magic" One. They don't seem to look quite the same, do they?

Now I am not putting out this particular example as being the "worst ever," it isn't by any means—it is quite an average. And I am not particularly cross with the constructor for fashioning such a poor replica of the "Magic" One because I don't suppose he realises the vital importance of sticking rigidly to specifications and carrying out the wiring neatly and efficiently.

But this particular "Magic" One is full of trouble (as are most of the really bad cases), and "P.W." readers may find it interesting and instructive if I run through the various faults that our Research Department located.

## THE ORIGINAL—



This is the original "P.W." "Magic" One receiver.

The set was declared bad constructionally on two general counts. (1) The lay-out differed a great deal from the original; and (2) the wiring was very poor.

Next it was discovered that for some reason, the grid condenser had been shorted with a short length of wire. (This is clearly visible in the photo.)

Further, connection had been made to the wrong screws on the condenser. These screws hold the foils in position and make contact with them. Unscrewing them may interfere with the operation of the component.

One of the members of the technical staff spent about an hour carefully testing the components in this set, and the major fault located was in the differential condenser.

This was found to be short-circuiting over a large part of the movement of the moving vanes, while over the remainder of their travel there was a low resistance leak.

### Practically Everything Wrong!

It should be mentioned, however, that this particular differential reaction condenser was of foreign manufacture, and was not one of the recommended British makes.

The moving vanes of the tuning variable of this particular set had got slightly bent, and short-circuits were also occurring here!

Taking all these things into consideration, I do not think that we can be blamed for this "Magic" failure, do you?

There is little that has been done in the making of this set that is right; practically

(*Continued on page* 274.)

## —AND A READER'S REPLICA.

The short-circuited grid condenser can be seen clearly in this plate. Note the very untidy wiring and how the layout of components has been seriously varied from the specification.

# SIR THOMAS BEECHAM TILTS AT THE B.B.C.

By THE EDITOR.

THERE seems to be little room left for doubt that Sir Thomas Beecham and the B.B.C. have severed "diplomatic relations." And as a result we wonder what will happen to the National Orchestra and other interesting schemes, about which we have heard so much in the past.

The ostensible cause of the rupture of the amicable relations between Sir Thomas and the B.B.C. seems to be this: that the B.B.C. is not content with the great honour of finding the money to arrange special symphony concerts for Sir Thomas to conduct, but, incredible as it may seem (to Sir Thomas) the Lords of Savoy Hill even insist on deciding what musical programmes shall be given! Amazing!

**"Those Concerts Were Mismanaged."**

Sir Thomas, it will be remembered, has been "billed" several times just recently to conduct at B.B.C. concerts, but has not done so; he was to have conducted at the Mahler Symphony Concert, but decided not to at the last minute. According to press reports, Sir Thomas did not approve of the programme of music chosen by the B.B.C. So Sir Henry Wood conducted instead.

And now Sir Thomas, back from Cologne, has treated himself to another tilt at the B.B.C.

"The failure of the B.B.C. symphony concerts last winter," he said, "was typical. Those concerts were mismanaged in every possible way, and naturally people would not go to them.

"Most of the seats that were not empty were filled with poor relations and housemaids.

"Of course, people will not go to hear an orchestra, no matter how good, called 'the B.B.C.' And, of course, a collection of players, no matter how good, is not turned into an orchestra without someone at the head whose job it is to do the turning. The B.B.C. imagines that because it has money, therefore it can dispense with the arts of concert organisers—arts which are the result of long experience."

**"Without Knowledge or Talent."**

The B.B.C. does not, of course, imagine anything of the sort. It has excellent musical advisers—of the high-brow, middle-brow, and low-brow calibre, and naturally, as it finds the cash, it reserves the right to decide how it shall be spent.

It is not so long ago that Sir Thomas was bewailing the fact that no one would put up money for British musical enterprise, but now, when the B.B.C. offers a heaven-sent opportunity, Sir Thomas is still not satisfied. A pity.

"The B.B.C. has mistaken its function," says Sir Thomas. "It should be a client of the music-makers. It should not attempt the running of musical performances itself, for that is a business for which it has proved itself, and very naturally, to be without knowledge or talent."

Does this mean that Dr. Adrian Boult, Mr. Percy Pitt, and others who have done so much to develop the musical side of the B.B.C., do not know their job? We can hardly think Sir Thomas means that.

"The time is coming," Sir Thomas says, "when broadcasting, no longer a novelty, will fall into a pretty insignificant position so far as music is concerned.

"The good musicians will no longer broadcast. Many do not as it is, and Schnabel refuses to make gramophone records.

"Wireless and the gramophone are the merest parasites on the body musical. In the essential art of making music they have never given a farthing's worth of help. No artist has ever got from them a particle of stimulation he gets from a real audience."

Very pretty; but, apart from wireless, the gramophone has given the artiste a good deal of stimulation—in the form of world-wide publicity and hard cash from royalties. Sir Thomas, we believe, has also made gramophone records.

Sir Thomas concludes his little tilt at the B.B.C. by saying: "As for the B.B.C., it simply squanders money in a muddling, blundering way, without a policy (on its musical side) or a future."

Really! We begin to think Sir Thomas would do very well in the House of Commons!

* * *

But listen to the other side of the question. Listen, in fact, to Colonel Blois, the managing-director of the Covent Garden Opera Co.—the man who, from the early days of broadcasting readily agreed that excerpts from Covent Garden operas should be broadcast. Why—you can realise, when you consider his views on Sir Thomas's little tilt at the B.B.C.

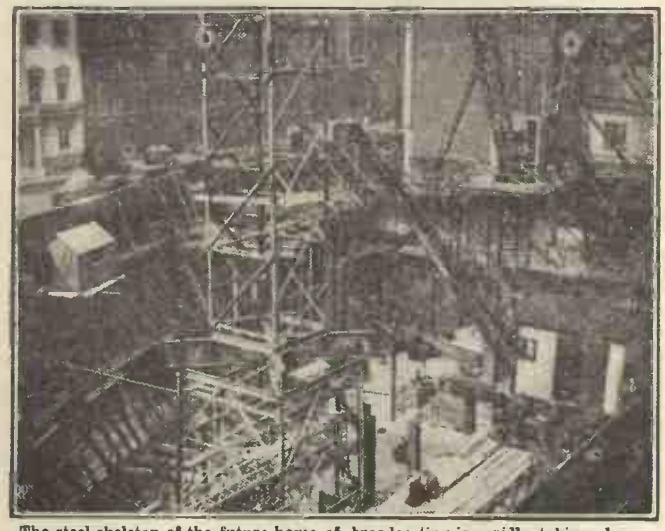
"Broadcasting has done a tremendous amount of work in popularising music and developing public taste. The B.B.C. has broadcast Covent Garden performances of opera for several seasons. Transmission and reception have in most cases been excellent. Our box-office results have improved year by year, and there is no doubt that a good proportion of the increased receipts is due to broadcasting and the resulting wish of listeners to see the great singers on the stage.

**Covent Garden Broadcasts.**

"In the recent tour of our English company in the provinces we found that a large part of our audiences had been attracted by earlier broadcasts from Covent Garden. My own opinion is that in thus promoting public interest in operatic music, broadcasting, so far from being parasitical, is doing invaluable service to composers and performers and to the cause of music generally."

That, we think, pretty well answers Sir Thomas' condemnation of broadcasting. If the managing-director of the opera season at Covent Garden candidly admits that broadcasting has had beneficial effects on his box-office, because of the musical propaganda effects of the work of the B.B.C., Sir Thomas ought to send up a prayer of thanks that, at long last, something is being done—and done effectively—to make music more widely appreciated in this country.

## PROGRESS AT PORTLAND PLACE



The steel skeleton of the future home of broadcasting is rapidly taking shape, as you can see by this recently-taken photograph.

## NOTE-BOOK NOTIONS.

**Usually the more screening-grid volts applied to a pentode (within the maker's limits) the better its performance, but the greater the H.T. current required for it.**

* * *

**Although other valves are occasionally to blame, it is generally the last or output valve that causes distortion.**

* * *

**Super-power valves should be worked at the maximum rated H.T. voltage with the correct negative grid bias specified, if the best possible quality is to be obtained.**

* * *

**Correct grid bias is particularly important for the last valve in a set, and too little grid bias will inevitably shorten the valve's life, introduce distortion, and waste H.T. current.**

* * *

**The chief disadvantage of using wood for a panel is that panel-mounting components are designed for panels of a quarter inch or less in thickness, and that wood of this thickness is not usually sufficient rigid.**

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# Modern Selectivity Standards

**Being a clear description of the various methods of obtaining sharp tuning with satisfactory quality, including some details of the Radiostat methods.**

**By CARDEN SHIELS.**

BY using the principle of electric resonance, Sir Oliver Lodge first made it possible to separate or select any one of a number of wireless signals transmitted simultaneously. Since then the problem of selectivity has in practice been limited to a search for new and improved methods of tuning.

The product of capacity and inductance in a circuit determines its natural "tune," i.e. causes it to respond more energetically to oscillations of one particular frequency than to any other. This is the "alpha and omega" of all selective systems of reception.

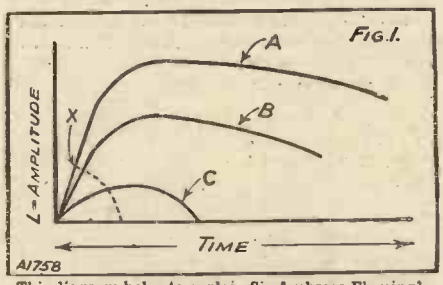
### Usual Methods.

The usual way of improving selectivity by tuning is to try to reduce the damping due to ohmic resistance. This can be done either directly by using low-loss coils and condensers, or indirectly by applying "negative resistance," i.e. reaction from a back-coupled valve.

There are also one or two striking instances where inventors have departed from what may be called mere improvements in tuning. The superheterodyne receiver is one example, and the super-regenerative circuit is another.

In the superheterodyne receiver the frequency of the signal wave is reduced by means of a local oscillator which "beats" with the incoming wave. The resulting "difference" frequency, when separated out by means of a detector, is of a lower frequency, and is therefore more easily subjected to intensive H.F. amplification than the original signal wave.

## CIRCUIT PERSISTENCE.

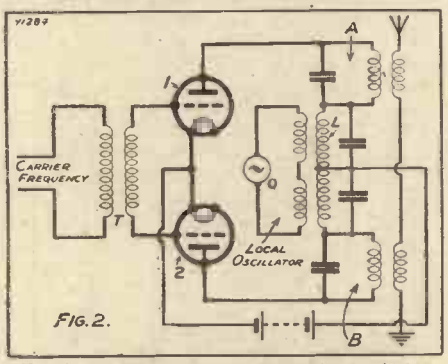



**This diagram helps to explain Sir Ambrose Fleming's theory of why a sharply-tuned circuit gives more bass than high notes.**

It must, however, be admitted that this peculiar advantage of supersonic reception has largely disappeared since the introduction of other methods of stabilised high-frequency amplification, such as the neutrodyne circuit and the use of modern screened-grid valves.

The super-regenerator circuit is an even more ingenious method of increasing both range and selectivity, though it, too, has fallen out of favour now that the cost of valves is so much less than it used to be.

## STOPPING "RINGING."




**Here is a circuit invented by Dr. Robinson which, by phase reversals, prevents distortion in sharply-tuned circuits.**

A super-regenerative valve is one maintained at the point of maximum efficiency by means of a local oscillator, which constantly urges the valve beyond and then "quenches" or thrusts it below the threshold of self-oscillation. The net result is that, in operation, the valve works at higher efficiency than is otherwise possible.

As previously stated, these exceptional types of circuit appear already to have outlived some of their original advantages. At the same time, fresh points of view are continually arising.

The standards of to-day may be "back numbers" to-morrow, but occasionally they again return to favour—as witness the revival in the modern beam of the short wave-lengths originally used by Hertz.

Recently, for instance, there have been signs of a revolt against the use of sharply-tuned circuits. It is now generally admitted that a receiver which is very highly tuned is often deficient in quality.

A sharp resonance curve involves the loss of a large proportion of the modulation or side-band frequencies which spread out on each side of the carrier-wave, and a corresponding falling-off in true musical response, particularly as regards the higher notes.

### Band-Tuning.

For this reason many makers now favour what is called "band-tuning," where the input circuit and intervalve couplings, instead of being sharply tuned, are deliberately designed to accept a definite "band" of frequencies so as to include the side-bands as well as the carrier-wave.

More recently still, the whole theory of side-band transmission has been brought into dispute by one of the foremost authorities on wireless science. In the opinion of Sir Ambrose Fleming, the modulation of a carrier-wave by microphone currents cannot truthfully be said to produce side-band frequencies in the sense that such frequencies actually exist and are transmitted bodily through the ether.

On the contrary, he regards them as merely a convenient mathematical fiction.

*(Continued on next page.)*

## PICKING OUT THE STATIONS.

**Here is the elaborate laboratory model of the Radiostat. It is capable of tuning-in stations that are being heterodyned, without any interference being heard.**

## MODERN SELECTIVITY STANDARDS

(Continued from previous page.)

He agrees that a "band" of frequencies may be created in the circuits of the receiver, as is the case in supersonic reception, but apparently attributes this to a peculiar property shared by all highly-tuned circuits.

### Free Oscillation.

The very fact that a circuit is highly tuned means that it is readily set into free oscillation. If a delicately pivoted pendulum is struck one sharp blow, it will continue to oscillate at its own natural frequency for a considerable time. Similarly, a tuned circuit tends to oscillate at its own inherent frequency for some time after the impact of the first signal impulse.

This is illustrated in Fig. 1, where the curve A shows the time during which a sharply-tuned circuit oscillates in response to a single impact. The curves B and C illustrate the corresponding effect on circuits which are less sharply tuned, or, in other words, more highly damped.

Now, according to Sir Ambrose Fleming, the effect of modulating a carrier-wave is simply to cause the *amplitude* of the carrier-wave to vary, so that the incoming signal consists of a single wave of constant frequency but rapidly changing amplitude.

But, from the curves shown in Fig. 1, it is clear that the tuned circuits now used in the ordinary type of receiver cannot respond faithfully to rapid changes in the intensity of a single-frequency wave. They swing or oscillate too frequently under the impulse of the first impact to be able to follow subsequent changes in the amplitude of the incoming wave.

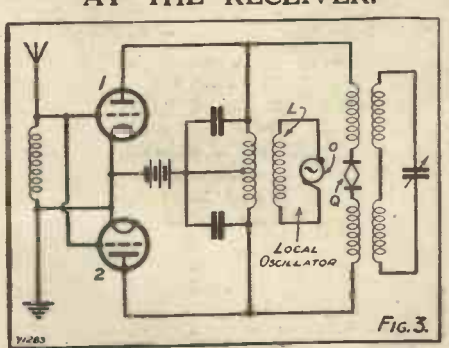
Dr. Robinson of the Stenode Radiostat Company has recently protected a system of wireless transmission and reception designed to prevent a tuned circuit from persisting in free oscillation, and in this way he increases its selective action.

Broadly speaking, the method he adopts is to use a carrier-wave which is continually reversed in phase at very short intervals, so that in reception the circuits first build up in voltage and then, when the phase reversal occurs, the original oscillations are damped out.

For instance, referring back to Fig. 1, a receiving circuit having the resonance properties of the curve A is allowed to build up in amplitude to the point X, and is then rapidly damped so that the response falls off, as shown by the dotted line curve.

As the phase reversal takes place some 15,000 to 20,000 times a second, the net effect is to prevent the circuits from falling into sustained or "free" oscillation.

## AT THE RECEIVER.




With this circuit at the receiving end it is possible to tune very sharply without the usual bad effects of very sharp tuning.

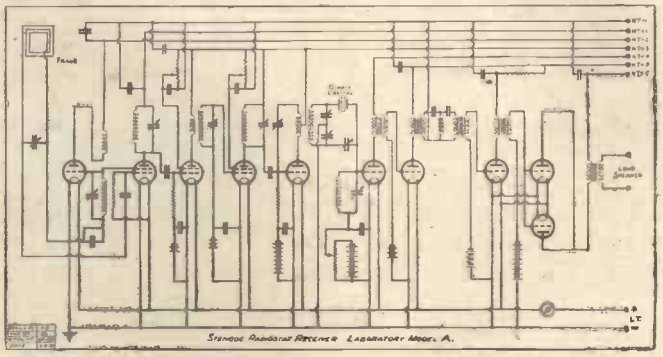
### How it Works.

Presuming that this can be done, such a receiving set would be better adapted to respond to the amplitude variations of a single-frequency carrier-wave than the ordinary type of tuned circuit.

The method of imparting a succession of phase reversals to the carrier-wave is illustrated in Fig. 2. The valves 1, 2, are coupled in push-pull relation to a source of radio-frequency oscillations through an input transformer T.

The output circuits comprise a main coil, L, and two circuits, A, B, both tuned to the desired carrier-frequency. A local generator O, oscillating at a frequency of, say, 20,000 cycles a second, is coupled to the main coil L. Its effect is to cause the valves 1 and 2 to "take charge" alternately, and in rapid succession so that the transmitting aerial is energised first by the circuit A, and then, in the opposite phase, by circuit B, so that the radiated carrier is subjected to a phase-reversal 20,000 times each second.

## A 10-VALVE STENODE SET.



The first five valves of this circuit form a superhet amplifier, the sixth valve is a crystal-controlled Stenode detector, and the remainder form a special L.F. amplifier.

Instead of reversing the phase of the carrier-wave, it is possible to secure an equivalent effect at the receiving end by the circuit shown in Fig. 3.

The received signals are applied to two valves 1, 2, arranged in push-pull and coupled to an output circuit comprising a piezo-electric crystal tuned to the carrier-frequency. A 20,000 cycle local oscillator O is coupled at L to a circuit shunted across the valves, so that during one half-cycle of the local oscillation the valve 1 is in operation on the crystal, whilst during the second half-cycle the valve 2 is effective on the crystal in opposite phase so as to damp out the first series of oscillations.

### Ingenious System.

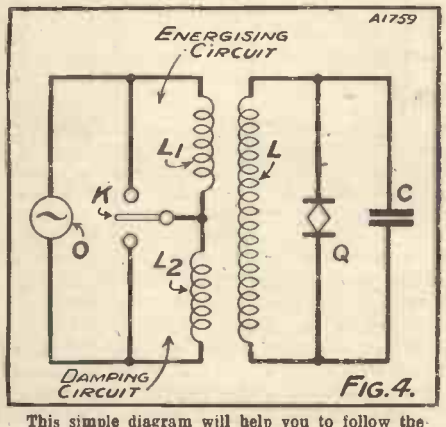
The action is illustrated more clearly in the diagram of Fig. 4, where the local oscillator O is shown coupled to two coils $L_1$, $L_2$, reversely wound, but both coupled to the selective circuit L, C comprising the crystal Q.

When the key K is in the upper position —i.e. when the valve 1 of Fig. 3 is "in charge," the coil $L_1$ induces signal voltages into the circuit L, C. Immediately after (when the valve 2, Fig. 3, is effective), voltages of reversed phase are induced into the circuit L, C from the reversed coil L2, so as to damp out the original oscillations.

## HARD AT WORK IN THE "LAB."

Months of intensive research are necessary to produce something really new in radio. Here we see members of the Radiostat Laboratory hard at work.

## PHASE REVERSAL.




This simple diagram will help you to follow the principle on which the circuit of Fig. 3 works.

# Making Your Own Coils

**Here are details for making a set of coils which can be used in any receiver that requires coils of the two-pin type. You will be surprised how easy they are to make, and their cheapness renders them eminently suitable for the "Economy" Three which was described last week.**

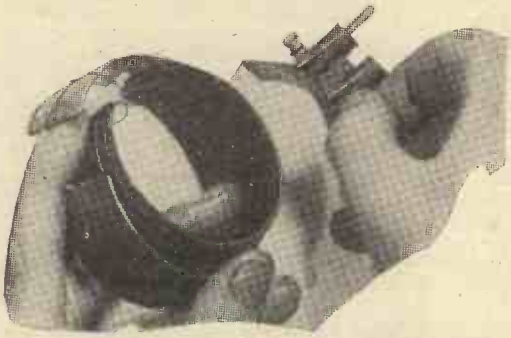
**By THE "P.W." RESEARCH AND CONSTRUCTION DEPT.**

THERE is no more efficient form of coil than the simple solenoid—at any rate for the medium band of wavelengths.

This type of coil is simple to wind and only calls for a very moderate expenditure on materials. A set of coils can be made in an evening.

To cover the medium wave-band a set of six coils will prove ample for simple sets, and will serve the needs of both aerial tuning and reaction. The coils can be made the equivalents of Nos. 25, 35, 40, 50 and 75, the sixth being a No. 60 X.

## EFFICIENT, SIMPLE AND INEXPENSIVE.



A "double-bank" winding is used for the larger coils, and here you see how the split outer former is fitted over the inner one. The coil mount is also seen in this photograph.

The material required for the construction of these six coils is as follows:

1. A length of 2½ in. diameter coil former 8 in. long.
2. 6 coil mounts.
3. 3 oz. of No. 26 S.S.C. wire.
4. A roll of surgical tape.

The former is first of all cut in to eight 1-in. lengths. The reason for the need of eight formers when only six coils are to be made will be explained later.

### Winding The Coils.

One of these small formers is taken and the construction of the No. 25 coil commenced. First of all two small holes should be pierced near one of the edges of the former. They should both be roughly ⅛ in. in from the edge and about ¼ in. or a little less apart. The wire is reeved through these holes a couple of times so that a "free end" of wire about 2 in. long is left for making connection to one terminal on the coil mount.

Winding is then commenced by making a complete turn round the former. The next turn is laid on so that the two turns are touching and the process repeated until fourteen turns in all are wound on the former.

The winding is held fast at the finish by means of two pierced holes as were used at the commencement. The wire on the coil can be cut from that on the spool so that another 2-in. "free end" is left.

### Connecting The Mounts.

One of the coil mounts is then taken and prepared for attachment to the coil. Lay this coil mount on the table with the pin and socket towards you, and with the pin on the right. Next connect one end of the coil to the socket contact after threading it through the small hole provided.

Now, keeping the coil mount in the position indicated above, arrange the coil on the mount so that the winding (starting at the end you have just connected), runs in a clockwise direction, and connect up the other end of the coil.

A permanent fitting of the coil to the mount in this position is then achieved by binding them together with the surgical tape, which should be about ½ in. wide. When this has been done, the coil is completed.

Too much stress cannot be laid on the importance of strictly adhering to these instructions as, only by so doing, is the correct winding direction achieved which is necessary for obtaining reaction effects.

### The Double Formers.

The Nos. 35, 40 and 50 coils are made in exactly the same way as described above, except that they consist of 22, 30 and 35 turns respectively.

For the No. 75 coil a "two-bank" winding has to be employed. First of all, one of the four remaining formers is cut so that it can be sprung over one of the others.

An uncut former is wound with 25 turns in the manner described before, and when these are completed the cut former is sprung over this winding and another 25 turns wound thereon in the same direction.

The 60 X coil is constructed in a similar manner to the No. 75. That is to say, the "double-bank" method is employed. When however, 6½ turns have been wound on the uncut former, a "bight" should be taken in the wire and then twisted together. This should be regarded as an extra "free end," and it should be passed through a hole pierced in the former so that it protrudes inside the coil.

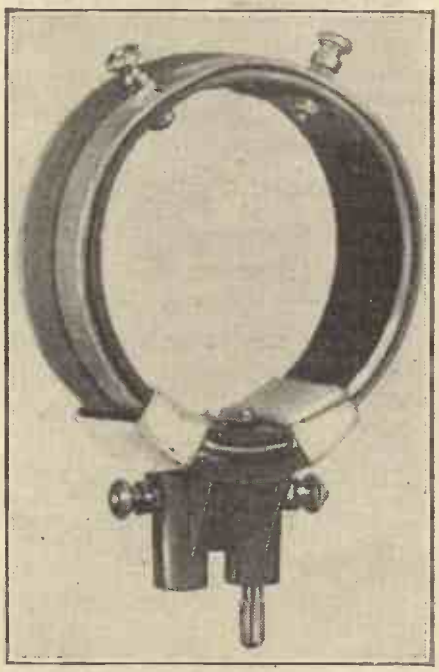
Another should be made at the tenth turn. Twenty turns in all are wound on before the cut former is sprung on. A further twenty turns are wound on this, and the coil finished off in the usual way.

The coil is not then, however, complete. It will be found that twenty turns do not fully occupy the available 1 inch of winding space. There will be a half inch or so to spare. In this space, at the top of the coil, two small holes are pierced and fitted with small terminals, as shown in the photograph.

The two "extra free ends" occurring at the sixth turn and a half and at the tenth are then soldered one to each of the shanks of these terminals. Note should, of course, be taken of which terminal goes to the tenth turn, and which is the lower tapping.

When connecting up the ends of the "X" coil, the end which you join up to the socket should be the end nearest to the two taps.

## HOW THE COILS LOOK



If you follow the simple instructions carefully, not only will your home-made coils look as good as professionally made ones, but they will be quite as efficient.

## FROM THE TECHNICAL EDITOR'S NOTE BOOK.

# Tested and Found—?

### AMPLION TWO-GUINEA CONE.

LOUD speakers undoubtedly are getting better and better. Also they are getting cheaper, which is the sort of progress that appeals to the average constructor.

Messrs. Graham Amplion, Ltd., have always been well in the van in these respects, and their latest loud speaker, the Amplion Two-Guinea Cone, is a fine proposition.

For 42s. you get a cabinet model that has a first-class appearance. You will be able

The Amplion "Two Guinea" is a handsome cabinet model.

to gather some idea of its appearance from the accompanying photograph.

Also the instrument works very well indeed and has none of that overwhelming box resonance that mars the performance of so many of the less expensive cased-up cones.

There is an adjustment knob at the back with which the sensitivity of the speaker can be adjusted; and, by the way, its sensitivity is well up to standard.

I would advise all those "P.W." readers who are interested in new radio accessories to search out and hear one of these new Amplions in order that they themselves can see what excellent value for money it is.

### CLIX "SPRINGSCREW" WANDER PLUG.

Lectro-Linx Ltd., have produced something that is quite new in the way of wander plugs. If you can imagine an ordinary wander plug with its metal part removed and screwed into the side of its insulated top, at right angles, you have a fair idea of the "Springscrew." But the great feature of the "Springscrew" is that the metal spiral spring has a solid end, and so does not tend to open if it catches the side of a socket.

It makes a very nice fit with any average size of socket. As the lead comes out at right angles to the plug there is less strain on the device, and the result is a somewhat neater battery connection. The Clix "Springscrew" wander plug costs 2d., in either red or black, and you get it engraved with lettering at ½d. extra.

### ILL-USING A BATTERY.

If "P.W." readers could have watched me at work with a little two-volt accumulator the other day in the Research Department, I am sure a good many of them would have shuddered. I short-circuited it, banged it about, and then sent enough juice through it to run a small broadcasting station. The little accumulator came up smiling.

It is filled with "Jellacid," which is a speciality of Standley & Company, of 442, Mill Street, Liverpool. Otherwise it is of quite normal construction. "Jellacid" is a jelly-like substance so that a battery in which it is used instead of ordinary acid solution is completely portable.

The claims made for "Jellacid" are that when it is used, an accumulator can be over-charged, under-charged, or, in fact, completely ill-used without ill-effects.

The real test for anything like this is the test of time, and of careless usage over long periods of time, for many ordinary batteries filled with ordinary battery solution will stand up against over-discharge and under-charge for limited periods. Nevertheless, in that it displaces that nasty ordinary acid solution and makes a battery quite a portable sort of thing, without affecting its operating abilities, "Jellacid" lays claim to serious attention.

I must see how the sample cell stands up to period tests. T. Standley & Company can supply any type of accumulator with their special filling, and, I can say offhand, that it is every bit as good as ordinary acid solution, though how much better, if any, it remains to be seen.

### GOLTONE "NO-MAST" AERIAL.

An aerial can be a rather unsightly affair, and the usual suburban variety generally is. Also such an erection requires a certain amount of maintenance, especially during the windy months.

Messrs. Ward & Goldstone offer an attractive alternative to the usual suspended wire type in their Goltone No-Mast Aerial.

This is a quite simple affair, and consists essentially of a specially arranged sheet of metal gauze material held in a stout wooden frame.

This is fixed to the side of the house or to the chimney stack, and the stout lead-in which is supplied is led into the house in the usual way.

By the way, it is said that a "No-Mast" is used at Windsor Castle, and this surely is an interesting combination of the historic and the modern!

### WHEN YOU ARE BUYING—

#### (14)—TELEPHONE RECEIVERS.

**The "High-Resistance" types are needed for most ordinary purposes. Those that are of 2,000 ohms each earpiece are most generally used, and are quite satisfactory for crystal sets and one-valvers.**

**The "Resistance" as such is not a particularly useful quality, it is incidental to obtaining the sensitive response of the devices.**

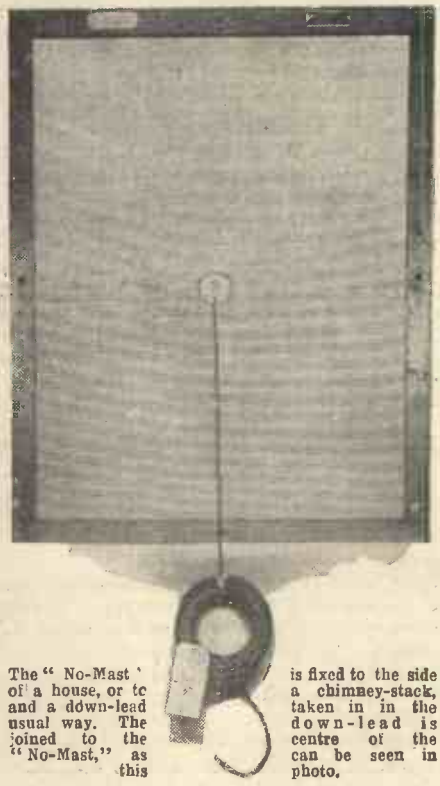
**Telephone receivers should be light and should sit comfortably and without weight or noticeable pressure on the head, otherwise they will cause headaches.**

**The cords should be stout and anchored securely at the ear-pieces, otherwise they will quickly develop faults. Also, the cords should be long enough for comfortable listening.**

**Telephone receivers ought to be tested for selectivity and quality before they are finally purchased. A crystal set test is as good as anything else—it is an eminently practical test.**

The complete "No-Mast" costs 24s., including full instructions for fitting.

I tested it thoroughly up against a standard aerial of normal dimensions, and found its pick-up to be very good. It is certainly an excellent device and one that should prove increasingly popular.



The "No-Mast" is fixed to the side of a house, or to a chimney-stack, and a down-lead is taken in in the usual way. The down-lead is joined to the centre of the "No-Mast," as can be seen in this photo.

# A NEW AERO-RADIO INVENTION

**Here are the interesting details of a wonderful new radio device which tells an aviator exactly how high he is flying.**

**From A SPECIAL CORRESPONDENT.**

RADIO has rendered still another signal service to aviation. It is "signal" in two senses of the word. For the last few years one of the most persistent of the problems which have faced airmen has been that of knowing exactly their height above the land. During heavy rainstorms or fogs, as well as during night flying, the peril due to this uncertainty has been very grave.

**A Wonderful Instrument.**

Various instruments have at one time or another been devised to overcome the difficulty, but in no one case did it appear that complete satisfaction was given. At last, working on the theory that the interval of time required for a radio impulse to travel from an aeroplane to the earth and back again to a receiving set on the 'plane might afford a solution, Dr. E. F. W. Alexanderson, one of the ablest of America's research engineers in the service of the General Electric Company of New York, set about making experiments with a series of wireless-echo altimeters.

After many months of patient investigation and ceaseless experimenting Dr. Alexanderson has at length devised an instrument which appears likely to meet the necessities of the case. It is a small recording instrument which can conveniently be mounted on the cockpit panel of an aeroplane in full view of the pilot.

It consists of a meter on which earth distances up to 3,000 feet may be recorded. It is in the lower regions, however, that the greatest danger lies, and it is in the recording of levels down to 50 feet that the new device has proved most serviceable. Three coloured lights—green, yellow, and red—indicate not "go," "caution," and "stop" as heretofore, but elevations of 250, 100, and 50 feet respectively, and the flashing of any of these lights gives the pilot immediate warning of his position with relation to the ground.

**Accurate Measurements.**

Because the time interval between the outgoing and the reflected radio impulse is so short, radio waves travelling with the speed of light, an indirect method of making such measurements was adopted by Dr. Alexanderson. In his experiments he used an oscillating receiver, one of the type which sends out a wave which may be picked up on other receivers as a squealing note or beat.

The echo or reflected signal was picked up on the same receiver which sent out the wave. Dr. Alexanderson then discovered that every time the aeroplane changed altitude by half a wave-length a whistling note went through a complete tone cycle, from low pitch to a high pitch and back again to a low pitch. By counting the cycles of the tone it was possible to measure the altitude, the measuring stick being one-half the wave-length of the aerial oscillator.

Thus it comes about that by means of the meter, graduated from 3,000 to 200 feet, the pilot may read his altitude within those limits at any time. The echoes indicating height are periodic, becoming stronger as the 'plane approaches earth. The periodic character of the echo, and the chance that the pilot would not see the instrument at the instant an echo was recorded, presented a problem which Dr. Alexanderson met by developing a memory meter.

In this instrument the echo is recorded as altitude when it occurs, and the meter continues to hold that reading until a stronger echo indicating a lower altitude occurs. In approaching the earth the memory meter gives a continuous indication of altitude.

**Depth-Sounding.**

If depth sounding is desired when climbing, in which process the echo is becoming weaker, a push-button may be used to eliminate the memory features of the meter, and each succeeding reading is an indication of the next echo. Thus a depth-sounding may be taken at any time during the flight, whether the 'plane is ascending or descending.

Dr. E. F. W. Alexanderson demonstrating the use of his wireless-echo altimeter.

## FOR YOUR NOTEBOOK.

**If you assemble your own batteries from dry cells do not forget that good insulation between the rows is even more important than insulation between the individual cells.**

* * *

**Although tap water is sometimes used successfully to renew the level of the electrolyte in an accumulator, its use is decidedly risky, and distilled water (obtainable at a chemist's for a few pence) is far better.**

* * *

**The requirements of an efficient L.F. choke for loud-speaker coupling are different from those of a choke used for valve coupling, so that an intervalve choke is usually quite useless for an output circuit**

# The P.W. "SAFE" SUP

**This is the third of the series of "Safe-Power" D.C. m modern lines after considerable research into the theor tended for multi-valve sets employing S.G. valves, ever descri**

**By THE "P.W." RESEARCH AN**

IN the course of this series we have pointed out that it is impossible to suit more than a proportion of our readers with any one mains unit, and hence we have found it necessary to produce a whole range of "Safe-power" units. So far, we have had the Junior model for small and some medium sets, the Senior model for general use with medium and some large receivers, and now comes the turn of the owner of a really large outfit, particularly of the S.G. valve type. (All these, of course, are for use on D.C. mains. We shall be starting another series for A.C. mains very shortly.)

**WHAT YOU WILL REQUIRE.**

**1 "Safepower" Senior metal base and cover, etc., with panel 10 in. × 8 in. (Wearite or Ready Radio, Keystone, Paroussi, Magnum, etc.).**
**1 0—250 or 0—300 voltmeter (Ferranti, or Sifam, Holtzmann, Weston, etc.).**
**1 10,000-ohm power potentiometer (used as plain variable resistance) (Varley or similar type).**
**6 Terminals (Belling & Lee, or other insulated type).**
**1 15,000 or 20,000-ohm potential divider (Igranic in unit). (Other good makes, such as Bulgin and Climax, can be used, but the figures given elsewhere for the voltages at the tappings will no longer apply exactly.)**
**1 Heavy-duty H.F. choke (Wearite, or similar type).**
**2 Smoothing chokes, inductance about 20 henries (R.I. 28/14 and Ferranti B1 in unit). (Equivalent types are available in other makes also, e.g., Varley, Wearite, etc.)**
**1 25,000 or 30,000-ohms wire-wound resistance and holder (Ready Radio, or Ferranti, Varley, Lissen, R.I., Igranic, etc.).**
**1 4-mfd. condenser, working voltage rating 250 or over (T.C.C., or Lissen, Dubilier, Hydra, Ferranti, Mullard, etc.).**
**3 2-mfd. condensers (Lissen and Dubilier, or other good makes as above).**
**1 1-mfd. condenser (Lissen, etc.). (Note: This can be of the ordinary receiving type, likewise the one connected to the H.T.+ 2 tapping. All others must be of high-voltage type.)**
**Wire, metal screws and nuts, Systoflex sleeving, plugs for potential divider, etc.**

For this reader we are presenting the Super model, which is really a last-word instrument capable of running the biggest sets, with plenty of separate voltage taps, elaborate smoothing and anti-motor-boating devices, and all the special safety features characteristic of the whole series. Of course, it costs more to build, but it is the sort of unit that you can make with the certainty that it will never get too small for your needs.

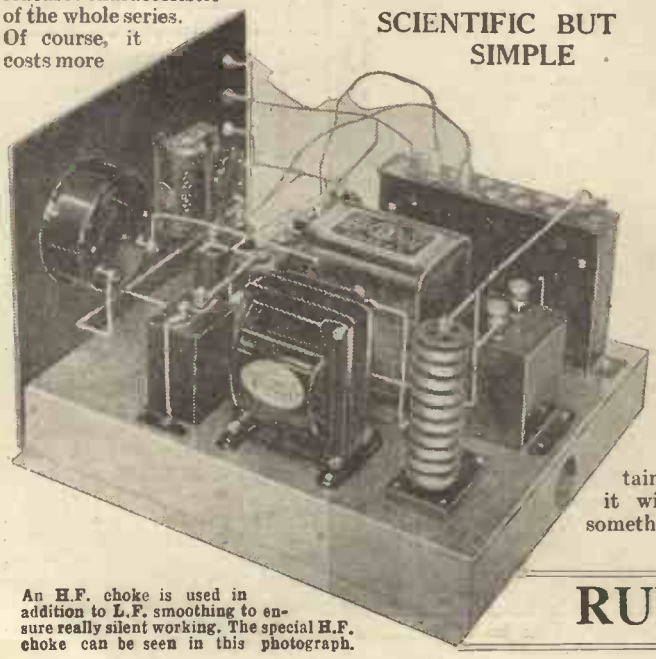
This last is a point which we regard as very important, for lack of understanding thereof leads to much disappointment in mains work. You see, when you make a mains unit you necessarily lock up a good deal of money in components, and if you only make it big enough for your present set, it is by no means unlikely that you will soon want to build a bigger receiver, and feel yourself unable to do so, because you cannot afford to make a larger mains unit at the same time.

We should, therefore, like to impress upon our readers that it is a wise policy always to make a mains unit a little bigger and more elaborate than is called for at the moment. It costs a little more at the time, but in the end it is far cheaper than having to scrap and rebuild in the future; it is really no extravagance but just sound business.

Therefore, we should like to give some very definite advice about making a choice from the three "Safepower" units for D.C. mains. If you are at present using a comparatively small or simple receiver, such as a two-valver or a very simple three, and you feel quite confident that you will be content with this for some considerable time to come, by all means build the "Safe-power" Junior unit. If, on the other hand, you are in just the normal frame of mind of the average enthusiast who is merely waiting until he can spare the time or afford the extra parts to build a bigger set, then you should choose the "Safe-power" Senior model. If, again, you are already using a fair-sized receiver, which would normally call for the use of the Senior model, such as a fairly advanced type of three-valver like the "Magic" Three, or a simple type of four-valver, you should certainly ask yourself how long it will be before you want something bigger still. If you cannot honestly assure yourself that you are likely to be content with your present outfit for some considerable time, then the Super model is the one for your needs. Although the Senior model would serve your present needs perfectly well, it would be a pity to build it and then find that in a few months' time you really want the more elaborate instrument.

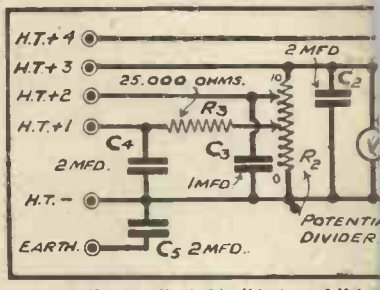
So much for general preliminaries. Now let us take a look over this "de Luxe" model, and see what it is all about. A convenient point of reference here is the circuit diagram, in which you will see that the Super model bears a general resemblance to the Senior one, but with certain additions. These are intended to make it suitable for the biggest

## SCIENTIFIC BUT SIMPLE



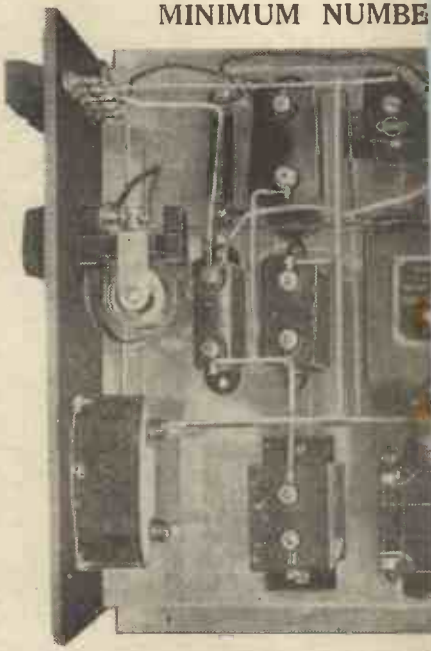
An H.F. choke is used in addition to L.F. smoothing to ensure really silent working. The special H.F. choke can be seen in this photograph.

## A SAFE, SILENT




Here is the circuit of this "last word" in and resistances are so arranged that coupli place in the un

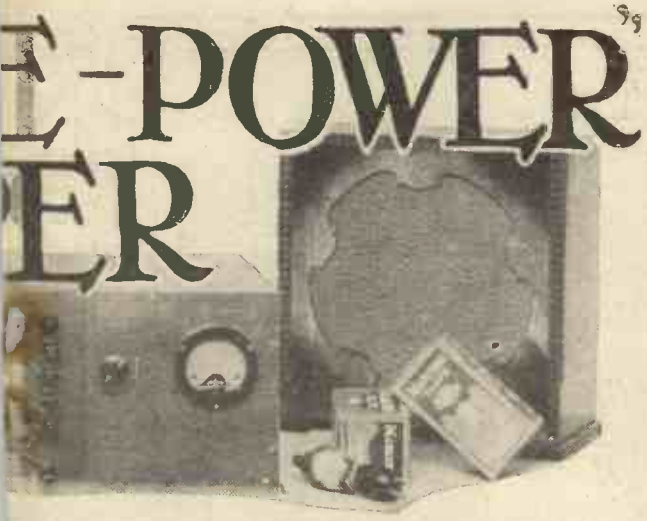
## MINIMUM NUMBE



A super unit for Super sets. The unit is capable matter how many valves it has, or how

## RUN YOUR SET FROM THIS SU

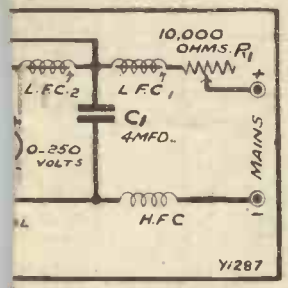
# E-POWER ER



ains units which are designed on absolutely
y and practice of mains units. This one is in-
and is the most efficient unit of its type
ibed.

**CONSTRUCTION DEPT.**

## SUPPLY




D.C. mains units. The chokes
ng effects cannot possibly take
lace.

## OF PARTS

working any normal receiver, no
uch current it requires.

have the smallest of sets now.

Now let us return to our circuit diagram, and go over things in detail. First of all, you will observe that there is a double or cascaded filter circuit, composed of two L.F. chokes in series and two main smoothing condensers. Just as in the Senior model, the tapping for the L.F. and power stages of the set is taken from the intermediate point on this cascaded filter, since a lesser degree of smoothing is sufficient for this tapping, and by taking it in this way a very valuable de-coupling effect is obtained. As you will see, the anode current of the L.F. valve or valves is thereby prevented from getting mixed up with those of the other valves in the set by the second L.F. choke, and the various reservoir condensers.

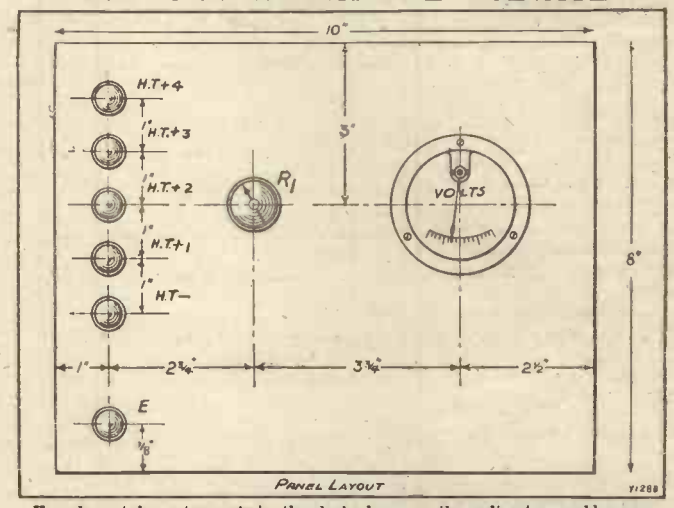
On the output side of the complete filter circuit three more positive tappings are taken off, these being for the detector and the H.F. stage, two of them supplying the latter, namely, one for the screening electrode of the usual S.G. valve, and one for the plate of this stage. You will note that two of these positive terminals have an adjustable voltage by means of a potential divider, these being for the detector and the screening electrode. The other (the one for the plate of the H.F. valve) has a fixed voltage which is the same as that of the L.F. tapping. This is normally the correct procedure, since the modern S.G. valve requires just about the same anode voltage as the ordinary power or super-power type.

The special "Safe-power" voltage measuring and adjusting scheme, which the reader has already seen in the two previous units, is of course, incorporated in the Super model. It is actually in just the same form as it was in the Senior version, and you will have no difficulty in following it out on the circuit diagram. First of all there is a voltmeter connected right across the whole circuit, so that it reads the voltage on the taps which supply the H.F. and L.F. valves. The idea is that you shall adjust this voltage to the correct figure for the particular power valve you are employing while the unit is actually delivering current to the set under working conditions, the control being found in the variable resistance on the panel which is marked "$R_1$." You just turn the knob of this control, starting with it fully turned to the left, until you get the correct 120 or 150 volts which your valve requires. You then know that it is obtaining exactly the right figure, and that the same voltage will be applied to the plate of your screened grid H.F. valve via the appropriate terminal (H.T.+3).

### VOLTAGES OF TAPPINGS

You then only require to know how to get the correct voltage on the detector terminal (H.T.+1) and the screening electrode terminal (H.T.+2), and this is a very simple matter. These voltages are

## YOU CAN WATCH THE VOLTAGE

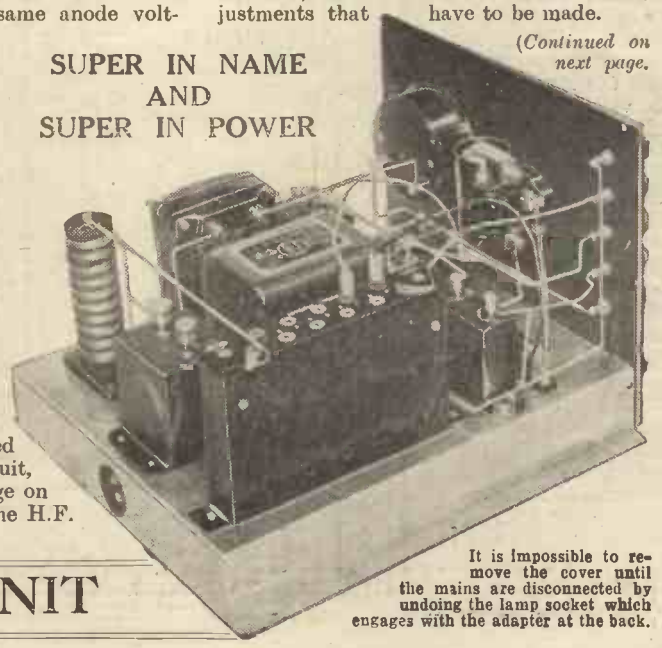



You do not have to work in the dark, because the voltmeter enables you to tell the voltage of each of the four positive taps, seen to the left of this drilling diagram.

controlled by means of plugs to be inserted in the sockets of the potential divider inside the unit, and we will now consider the adjustments that have to be made.

*(Continued on next page.*

## SUPER IN NAME AND SUPER IN POWER



It is impossible to remove the cover until the mains are disconnected by undoing the lamp socket which engages with the adapter at the back.

# PERLATIVE D.C. MAINS UNIT

and most elaborate sets, and just what they are you will see as you go along.

Before we start, however, may we just clear up one point otherwise liable to be a little confusing to the beginner? It is sometimes thought that large and elaborate mains units are not suitable for working small sets, because they give too big an output and have not got suitable controls. This may be true of some units, but not of the "Safe-power" series. By virtue of their special system of voltage control and measurement, even the biggest of them is perfectly suitable for working even a two-valver if desired. Hence, if you want to be very far-sighted indeed, there is no reason why you should not build the "Super" version right away, even if you only

## THE "P W." "SAFE-POWER" SUPER.

*(Continued from previous page.)*

Turn on the filaments of the valves in your set, place the resistance $R_1$ with the knob turned fully to the left and switch on the mains. Now turn the resistance $R_1$ gradually round until the voltmeter reads either 120 or 150 volts. If you get no reading, reverse the mains plug.

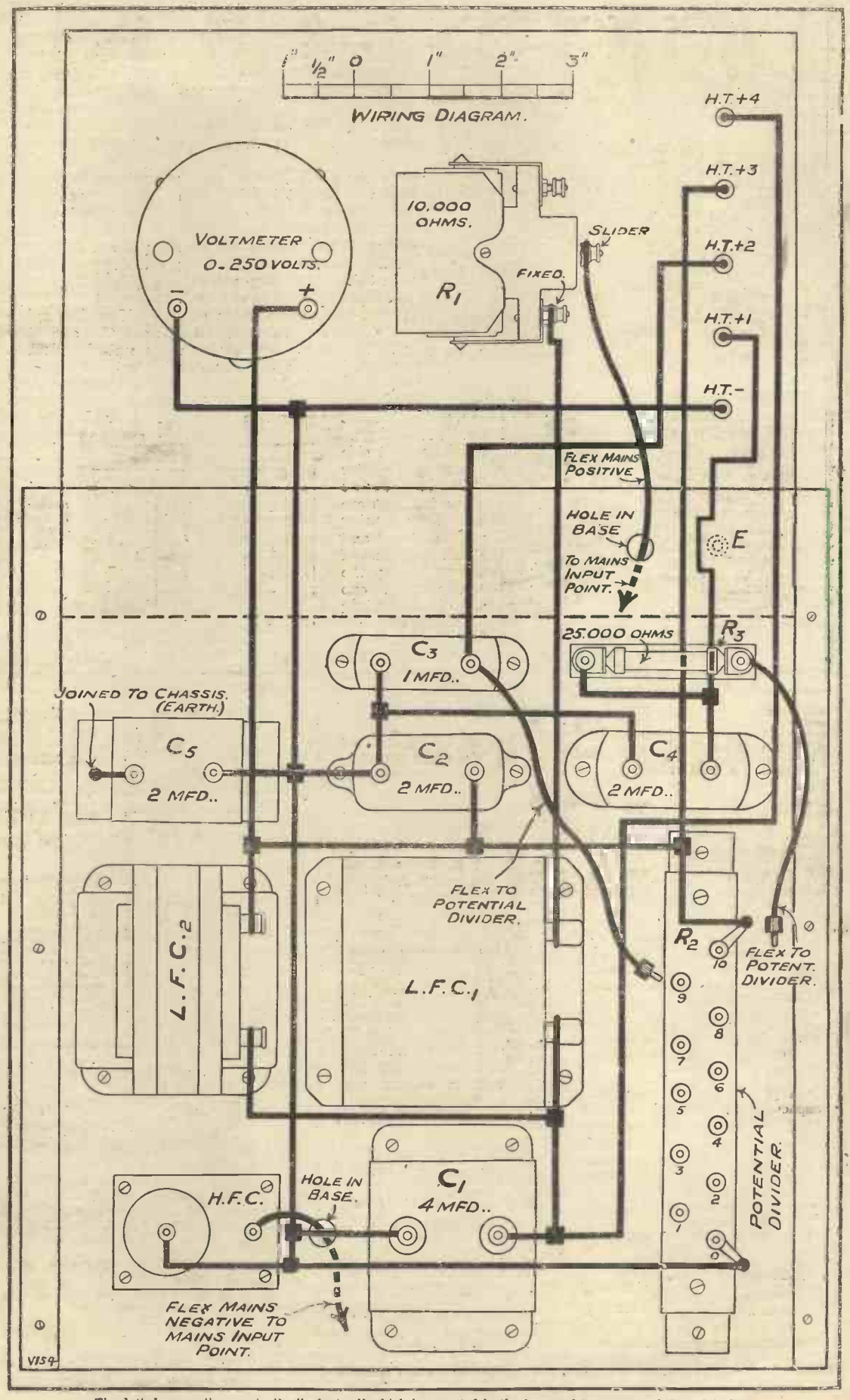
Having got the maximum voltage correctly adjusted, it is just a matter of placing the plugs controlling the voltages on H.T.+1 and H.T.+2 in the correct sockets on the potential divider and this is a very easy operation. The voltage on H.T.+1 is controlled by the plug on the end of a flex lead from the resistance $R_3$, while the plug from one side of the 1 mfd. condenser $C_3$ controls H.T.+2.

With the maximum set to 150 volts you will get the following approximate figures from the various sockets of the potential divider: No. 3, 40 volts; No. 4, 45 volts; No. 5, 60 volts; No. 6, 75 volts; No. 7, 90 volts.

With 120 volts on the meter these are the figures, again approximate (they vary a trifle with the load): No. 3, 30 volts; No. 4, 40 volts; No. 5, 50 volts; No. 6, 60 volts; No. 7, 73 volts; No. 8, 85 volts.

Note that the voltage on the detector valve will be dropped a little by the ant-imotor-boating resistance $R_3$. To allow for this, insert the plug one socket higher up than the voltage you would otherwise select.

You will observe that there is a special earth terminal upon the instrument and you must connect your earth lead to this and not to the old earth terminal on your set, which should now be left quite free.




The dotted connections go to the "adapter" which is mounted in the base and forms part of the safety lock.

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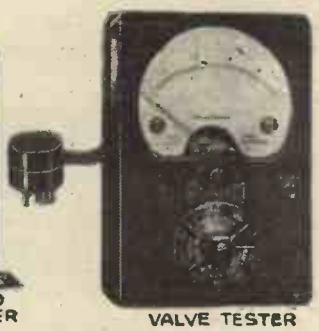
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M.C. 8.



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### THE "REGIONAL" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having failed to see any correspondence in your excellent paper regarding the "Regional" Four, of which you published a blue print a few weeks ago, I thought perhaps I might venture to write you and give you my experiences with this set.

I built this set according to your blue print, and followed it very carefully. It is the third set I have made, and all I can say is that it knocks the other two into a "cocked hat." I can get the following stations, all at full loudspeaker strength: Huizen, Konigswusterhausen, Lahti, Radio Paris, Daventry, Eiffel Tower, Warsaw, Motala, Kalundborg, Hilversum, and on the medium waves: Budapest, Vienna, Milan, Oslo, Prague, Midland Regional, Langenburg, Rome, Madrid, Bucharest, Toulouse, Hamburg, London Regional, Graz, Barcelona, Göteborg. Turin, Bratislava, Konigsberg, Barcelona (E A J 13), Moravska-Ostrava, London National, Horby Gleiwitz. At good loud-speaker strength I can get: Riga, Munich, Brussels No 1, Lyons, Paris (P. T. T.), Belgrade, Katowitz, Berne, Frankfurt, Wilna, Algiers, Bergen, Stuttgart, Brno, Brussels No. 2, Leipzig, Toulouse. There are about ten others which are unidentified.

In conclusion, I should like to thank you and your paper for a really good set, wishing POPULAR WIRELESS and its staff the best of luck.

Yours truly,
A. H. MCKENZIE.

Kent.

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### MELBOURNE ON THE "WAVE-CHANGE" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having constructed The "Wave-Change" Three, and getting good results on the London Stations, I thought it might interest you to know that it also performs on the short-waves. On Friday morning, 25th April, at 7.30 a.m. B.S.T., with a 2-turn P, 4 S, 4 R, I picked up a very good transmission on 'phones which was, I presume, a test from Melbourne, Australia.

I first heard a lady calling Hello London! Then a Mr. Brown holding quite a long conversation, in which he stated that the time was half-past four on Thursday afternoon. In all, I was listening for an hour and a half, and reception was entirely free from statics, but faded a little. Otherwise reception was—well, I consider it marvellous, as I am only a novice, and know very little about the technical side.

With regard to the aerial, my main outdoor aerial, 45 ft. high, was earthed and I was using 10 ft. of flex round the room. I had not altered the set from the original, and the condenser dial was not of the slow-motion type, although I have since fitted one. I have also received the ss. Leviathan, Zeesen, 5 S W and three foreign stations.

Many thanks for a good set.

W. H. BUTCHER.

S.W.1.

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## CORRESPONDENCE.

## "REGIONAL" FOUR.

**MELBOURNE ON THE "WAVE-CHANGE" III—TWO BROOKMANS REJECTORS—"MAGIC" OF COURSE!**

**Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.**

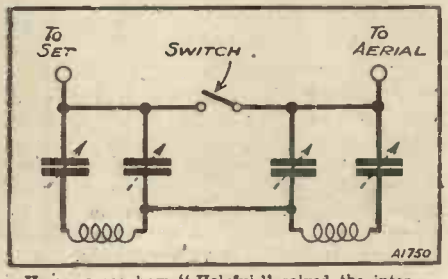
### TWO BROOKMANS REJECTORS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I made up the "Magic" Three as soon as your paper published the diagram, and, although the results were good, I found that on using a Lewcos triple-tapped coil 60X (aerial on tap 2) the volume was terrific; and, although I could separate the three locals, I could not get foreigners on account of the background of the locals.

I tried a Brookman's rejector (when I could obtain a Formodenser!) and found I could cut out one local

## HOW 2 REJECTORS WERE CONNECTED.




Here we see how "Helpful" solved the interference problem.

but still get a background of the other. So I made up two rejectors, and, adjusting them so that each individual local was cut out, I joined them in series and found that both locals were cut out simultaneously with the old 5 G B still coming through at normal strength and settings.

I then readjusted the rejectors until both locals came in and covered about 1½° on the dial.

One night I tuned in about 40 stations, 30 being at L.S. strength, and had the satisfaction of listening to a dance band at full strength 2° from 356 metres, and another band at 1½° from 261 metres. The circuit is as shown. The condensers are of the Formodenser J type. The coils consist of about 50 turns of 24 D.C.C. wire wound on a 2-in. diameter cardboard tube. The switch is for cutting out the rejectors if needed.

I was also surprised to find that S.W. reception was greatly improved when the rejector was in circuit.

Using a 9 coil in aerial and a 6 reaction, I found that the whole dial was alive with stations at 8 p.m. I tuned in 20 stations in a few moments.

I would add that whether I am on tap 1, 2 or 3 of the Lewcos coil, the rejector functions just the same.

Thanking you for a delightful paper.

I am,
Yours faithfully,
"HELPFUL."

Dunstable, Beds.

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### 63 ON THE SPEAKER!—"MAGIC," OF COURSE!

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel ashamed for not writing before—of course, re "Magic" Three. I made it just before Christmas, and since results have astounded me and all my friends, of which three of them have made it up.

It may interest you to know that I receive 63 stations on the speaker (I have no 'phones) on an indoor aerial. Like another of your readers I find a 100 coil is better than a 40 for reaction. I am using all Lewcos coils, and 2-volt Mullard valves, and an old transformer in first stage. Some of the stations I receive are Munich, Prague, Madrid, Dublin, Rahat, Glasgow, Frankfurt, Hamburg Algiers, Stuttgart, Breslau, Cardiff, Aberdeen, Bordeaux-Lafayette, Leipzig, Gleiwitz, Toulouse (P.T.T.), Belfast, Cork, Nurnberg, Cologne, Flensberg. Some of these are weak, but others are too loud and have to be detuned, not having a volume control.

Wishing your paper every success, and thanking you for an excellent circuit.

Yours sincerely,
A. F. GRIMES.

Warwick.

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### THE BROKEN FLEX.

The Editor, POPULAR WIRELESS.

Dear Sir,—I recently experienced a peculiar difficulty in tracing a fault in a variable condenser.

When in the set it would not work, when taken out it behaved like a lamb.

Finally, I cured the fault by replacing the bit of rubber-covered flex used as a pig-tail by a hair spring arrangement.

An autopsy was then held on the bit of flex, which was found to be broken off short through every strand of wire.

Verb sap, don't use rubber-covered flex for pigtails.

Yours, etc.,
V. W. DELVES-BROUGHTON.

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# SHORT-WAVE NOTES.

**By W. L. S.**

AFTER a day's intensive listening on the 170-metre amateur band, equipped with a receiver comprising a screened-grid stage, detector and two L.F., the last stage using two big valves in push-pull and a moving-coil speaker, I am more than favourably impressed by the general standard of amateur telephony on this wave.

Generally speaking (leaving out the horrible exceptions of "mike in the earth-lead" and absorption control of various kinds), the quality of gramophone records and speech falls very little short of the average broadcast transmission.

**Miniature 2 L O's.**

One or two of the best examples were quite up to 2 L O's standard as far as gramophone records are concerned, and at least one was better. The amateurs working on this wave are on the whole, quite as keen as the "DX-merchants" that comb the 20-metre and 10-metre bands, but in a different way.

Instead of being thrilled by sending any old signal to a vast distance, they take a pride in sending the best possible signal over comparatively short distances.

Those working on C.W. cover quite good ranges, and in the morning I heard G 2 C W (near Bath), who was at thoroughly good strength in South London and was received at a good R.6 on one valve when I changed over to another receiver.

Among those putting out good telephony at the time I listened most, were G 6 N F, G 2 A X, G 5 Q H, G 6 A M, and half a dozen others whose calls I did not log. The best examples of 1930 signals in the C.W. class were G 2 C W, G 2 H P and G 6 S F.

"A. M. S." writes on the subject of differential reaction control for short waves. In connection with my recent remarks, he points out—quite rightly—that whereas all that I said about the fact that there is already sufficient capacity in the average short-waver to by-pass all the H.F., the differential method has the other advantage of controlling oscillation smoothly without varying the tuning.

The fact is, "A. M. S.," that I very seldom have trouble in obtaining these conditions with ordinary throttle-controlled reaction, but I quite agree that in some cases differential control *would* be an advantage for short waves.

Short-wave conditions, by the way, changed completely round with the coming of the new moon on April 27th. Instead of the few South Americans usually audible after dark there was the usual pack of "W" stations, and from what I have heard during daylight, conditions have changed just as much.

In the early mornings one New Zealander and quite a number of West Coast Americans have been heard, and Asiatic signals have been better in the early evening. One of the lustiest from this quarter is V S 6 A B at Hong Kong. V S 7 A P at Colombo is another very consistent signal.

**G.P.O. Van Wanted.**

One of the peculiar noises that often comes on late at night in my locality, and that I have always put down to the thermostat in an electric bed-warming pad, apparently is located much further away than I suspected.

A fellow-transmitter quite five miles away reported that he was getting the same noise at the same time as I mentioned it. From this it would appear that it is caused by something far more powerful than an ordinary domestic accessory!

It may possibly be at the power station or at a sub-station on the electric railway. When shall we have a G.P.O. van available for the detection of *this* kind of interference?

# CAPT. ECKERSLEY'S QUERY CORNER

WHEN YOUR NEIGHBOUR'S SET "TUNES" YOURS—INTERFERENCE FROM THE BELL—H.F. IN THE L.F. STAGES.

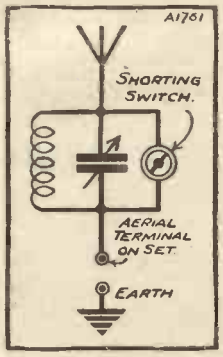
**Under the above title, week by week Captain P. P. Eckersley, M.I.E.E., Late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.**

### When Your Neighbour's Set "Tunes" Yours.

M. E. W. (Bow).—"Unfortunately, it is necessary for me to erect my aerial parallel and extremely close to my neighbour's aerial. I find that when my neighbour is receiving the 356-metre transmission that I also receive it, irrespective of my aerial tuning.

"My set consists of a detector and 1 L.F., with a directly-coupled aerial circuit. Do you think that the use of loosely-coupled aerial circuits in both cases will eliminate this fault?"

It is very difficult to make authoritative and hard and fast ruling on the matter of picking up the second transmission, because your neighbour is tuned to it with his n early-touching aerial, but I should say




### SIMPLE SWITCHING

An ordinary filament switch will cut out a rejector if wired across the rejector circuit, as shown.

that better than loose coupling in both cases would be to connect a rejector in series with your aerial.

The object of the rejector is to present a high impedance to frequencies of a certain defined value + and − a small band width of neighbouring frequencies. The rejector can easily consist of an ordinary tuned circuit, with a fairly low-resistance coil connected in the aerial, as I show in my diagram.

This could be set to reject the 356-metre wave-length when you are listening to another wave-length. If, of course, you want to receive the 356-metre wave-length you will have to short-circuit the rejector, and this can be done as shown by a shorting switch.

As a reader of POPULAR WIRELESS you will know that there is a device which is superior to the one illustrated, called the "Brookmans Rejector," and I should write to POPULAR WIRELESS (if you have not already got the specification), asking them how to make up a rejector for this wave-length.

### Interference from the Bell.

G. L. M. (Dulwich).—"Just recently I have had installed some additional electrical apparatus at my home, including an electric bell operated from the mains.

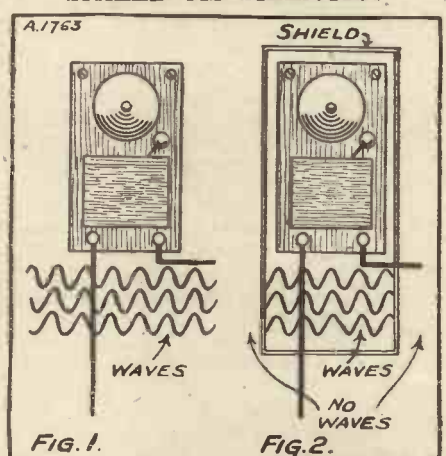
"Previous to the installation of the above, I had no interference whatsoever from the mains when receiving wireless programmes. I now find a continuous hum takes place which is increased tenfold when the bell is actually ringing. Why is this?"

Bell wire, I think. You see, if you make an electric disturbance of any kind and tie an unshielded wire to it the device makes electric waves. Thus see my Fig. 1.

This is the principle of all wireless transmission, and you can do "wireless" with an electric bell quite nicely. But Faraday found that if you put any electrical disturbance inside a complete shield of metal all the disturbance stayed inside. Thus see my Fig. 2.

So if you have the ordinary electric wiring of a house as the centre of disturbance and it is connected to the mains, the alternating currents set up ether waves. If you tie on a bell or an electric motor the waves are intensified by the fact that the bell or motor makes more abrupt changes than the alternating current by itself.

### SHIELD AS SILENCER




This sketch shows how the interference can be confined by a metal screen.

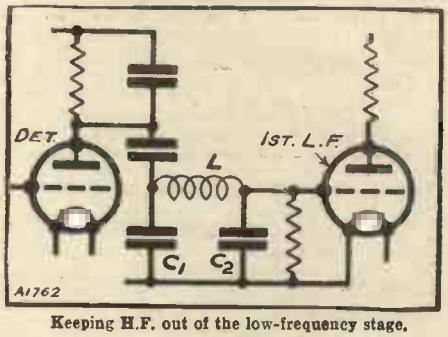
But if the mains are run in metallic conduit they can't radiate—they are shielded. But I'll bet your bell and so on is wired up with unshielded wire which allows it to radiate. Or the bell may be exposed, or part of the system is exposed. So it radiates electric waves, and these get picked up by your set.

Cure—"shield" all wiring and apparatus.

### H.F. in the L.F. Stages.

L. M. (Barkingside).—"My receiver is 'honestly, truly, faithfully' intended for reception of the two Brookmans Park programess only. It is operated from an

### AN H.F. FILTER.




Keeping H.F. out of the low-frequency stage.

indoor aerial, and the circuit arrangement is S.G. H.F., anode detector, and two resistance-coupled L.F. stages.

"The last valve is of the L.S.5 A class with plenty of H.T. and G.B. There is a milliammeter permanently in the plate circuit of this valve to check over-loading.

"I notice, however, that the needle of this metre gives a violent kick when the aerial and H.F. tuning circuits are brought into resonance with the transmitter wave-length.

"A friend tells me that this indicates that H.F. is getting into the L.F. side of the receiver. Can you tell me if this is so, and if it matters?"

Maybe it is high-frequency; but it seems an awful lot to be pushing your needle about like that. If it's H.F. you can only get rid of it by discouraging its series path by air-cored chokes, and encouraging its path away to earth by parallel condensers.

Thus see my diagram: L is an air-cored choke and $C_1$ and $C_2$ are condensers; but $C_1$ and $C_2$ must be very small indeed.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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*The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

# QUESTIONS AND ANSWERS

### TOO MANY TURNS?

S. E. (Ealing).—"Ever since Brookmans began, I get the London Regional perfectly; but I am not so successful with the National on 261 metres. It seems to be that the dial will not turn back far enough.

"The London Regional comes in at 61 and I lose all trace of this at about 35, when I begin to pick up very faint National at 25. Going back right to zero, it gets stronger as I go; but I do not seem to be able to turn down far enough. My neighbour suggests that I have too many turns on the coil.

"Is this right, do you think?"

Undoubtedly. If the coil is one of the plug-in type, use a size smaller than the present one; but, if it is a home-made coil, a few turns of the winding (say, 6, 7 or 8), should be removed so that you can tune a little lower.

We suggest that if you have any difficulty, you let us have a sketch of your circuit, as it may be possible to obtain the same effect by decreasing the condenser capacity, instead of decreasing the inductance by taking turns off the coil. Possibly you will never receive the National programme quite as strongly as the Regional, but it should be very much better than at present when you are able to "tune through," as at present your circuit does not tune down to the National wave-length.

### WORKING TWO LOUD SPEAKERS.

F. R. (nr. Rugby).—"At present the set is in the dining-room, and I take the loud speaker on a flex through the kitchen into the drawing-room. I want to get a second loud speaker to work in the kitchen. Do I break the flex lead there or do I have to have a separate wire? If the former, which wire?"

All you have to do is to break one of the leads going to the loud speaker (it does not matter which), and join up the new loud speaker in series with it. Although it does not matter in which lead you put it, there is a right and a wrong way of connecting it to the lead, unless you are using an output filter.

If you examine the loud speakers you will notice that they each have a positive terminal which is marked +, or coloured red, and a negative (or black) terminal. Your set also has one positive "loud speaker" teminal, and one negative, and the final connections for the two loud speakers should be as follow:

Direct from the positive loud-speaker terminal on the set to loud speaker No. 1's positive terminal. From this speaker's negative terminal to the positive terminal of loud speaker No. 2. To complete the wiring the negative terminal of this latter speaker (No. 2) should go back to the negative lead on the set.

If one loud speaker is wanted when the other loud speaker is not, the latter can be cut out of circuit by connecting a wire across its terminals. If you require to do this frequently, it is a good plan to wire up a switch across the speaker's terminals.

In the "on" position it acts as a shorting switch and cuts out the loud speaker.

### OPERATING THE "ANTIPODES ADAPTOR."

D. W. (Paddington).—"I am thinking of making up the 'Antipodes Adaptor,' but do not understand how a set with long-wave coils in it can tune to short waves. How does the unit alter the tuning of the ordinary set?"

It does not! What the "Antipodes Adaptor" does is to put an entirely new tuning unit in place of the old one, which is cut out of circuit altogether.

On the longer waves you tune on the ordinary condenser, and coil and when you plug the "Antipodes Adaptor" into the detector valve socket you disconnect (automatically) the ordinary tuning coil and condenser, and join up those in the unit instead. In fact, when the unit is plugged in you simply ignore the ordinary tuning controls, and use the unit instead.

### HIS NEW SET.

H. M. (Croydon).—"I am enclosing a circuit of my proposed five-valver, all the components having been worked out very carefully from information gleaned from 'P.W.' Before actually commencing construction I should like you to look over it."

It is fortunate that you let us have the diagram, for, although each stage would in itself be an efficient stage, the finished receiver would have been utterly disappointing.

The chief trouble with it is that you have aimed at getting far too much amplification per stage, with the result that even the louder *foreign* stations would easily overload the detector, and the further high amplifications suggested by you would result in murderous distortion.

Honestly, it would be a waste of time and money to build it up as it stands. If you will let us know exactly what you are aiming at in the way of results, and where the set is to be used, we shall be able to recommend a set correctly designed for the purpose you have in mind

### L.T. CHARGING.

W. R. F. (Hartlepool).—"I am thinking about installing a charger for my L.T. battery. What are the chief points to watch?"

If you are going to do your own charging, you should purchase a hydrometer as well as a voltmeter, so that a good check can be kept upon the battery. Although the outlay on top of that for the charger may seem excessive, it should be remembered that with a suitable charger working properly the L.T. battery problem no longer exists, and as a very long life is obtained from the apparatus, replacements and renewal costs are almost negligible.

Batteries can be charged only from direct current, so that if your supply is A.C. you will need a rectifier. You must, of course, always connect the battery the correct way round, i.e., positive to positive main supply, and negative to the negative.

## WHAT DO *YOU* THINK ABOUT THIS?

**One "P.W." reader wrote from Edinburgh to say that he couldn't trace the cause of a spark which occurred when he plugged in the H.T.+2 lead. The H.T. battery lasted well, and quality etc., was O.K., but he was worried by this little spark when the +2 plug was moved to a different tapping on the H.T.B.**

**A new 2-mfd. condenser had been connected from H.T.— to +2 to remove a slight hum, and this was taken to the shop and tested—insulation O.K. All other components and wiring were sound, and results seemed perfect, but the little spark persisted when the condenser was put back again to get rid of the hum. Could you have told this puzzled reader**

### WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to above next week.)

*Last week's puzzle (from Southend) was the old and simple snag of too many terminals. The reaction condenser had one earthing-terminal, and this was at first joined in circuit in mistake for the fixed plates!*

## CAN WE HELP YOU WITH YOUR SET?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this, an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made by 'phone, or in person at Fleetway House or Tallis House.

The charging current supplied must be within the limits laid down by the accumulator makers, and as a general rule rather slow charges are better than fast charges at a higher rate. In fact, a "trickle" charger is very suitable for most wireless batteries.

With ordinary chargers some form of resistance is required to cut down the current to the necessary degree, and in many cases this can conveniently be a lamp; or, indeed, with D.C. mains, the whole of the lamps in the house may be wired in series with the accumulator, so that whenever a light or vacuum cleaner or electric iron is used, the current passes through the accumulator and helps to charge it.

An experienced electrician will be able to advise on the practicability of this for any particular case, and as inexperienced persons should not interfere with the mains, he should carry out all the wiring, allowing for fuses, safety covers, etc.

With direct-current mains it is usually much the best plan to insert the charging apparatus in that wire which is earthed. You can find whether the negative or positive is earthed by joining a flexible lead to a tap or other large earthed object, connecting it to a lamp of the ordinary household supply voltage, with another flexible lead coming from the other side of the lamp.

If this second lead is touched alternately on the positive and negative mains, one will light it but the other will not, and the one which does *not* light, of course, is the main that is earthed.

This is the main in which the charger and battery should be connected.

### A CURIOUS FAULT.

D. A. C. (Eastbourne).—"For some time reception had been spoilt by a curious crackling sound in the speaker, which I have been

(*Continued on page 274.*)

*THE SUCCESS OF THE YEAR*

# 1930 MAGIC 3

**PRICE LIST OF PARTS.**

| | £ | s. | d. |
|---|---|---|---|
| 1 Drilled ebonite panel, 18" x 7" | | 6 | 0 |
| 1 Hand-polished solid oak cabinet, with baseboard | 1 | 10 | 0 |
| 1 Ready Radio ·0005 variable condenser | | 4 | 6 |
| 1 J.B. slow-motion dial | | 5 | 6 |
| 1 Bulgin B/M neutralising condenser | | 5 | 0 |
| 1 Ready Radio ·00075 "Brookmans" condenser | | 3 | 6 |
| 1 Ready Radio Differential condenser | | 5 | 0 |
| 2 Ready Radio on-off switches | | 2 | 6 |
| 1 Igranic volume control | | 6 | 0 |
| 3 W.B. sprung valve holders | | 3 | 9 |
| 3 Ready Radio single coil holders | | 2 | 6 |
| 1 Lissen super L.F. transformer | | 19 | 0 |
| 1 R.I. "Hypermite" L.F. transformer | | 12 | 6 |
| 1 Keystone H.F. choke | | 5 | 0 |
| 1 R.I. ·001 compression type condenser | | 2 | 6 |
| 1 Dubilier ·0003-mfd. fixed condenser | | 2 | 6 |
| 1 Lissen 2-meg. grid leak with holder | | 1 | 6 |
| 1 T.C.C. 2-mfd. Mansbridge type condenser | | 3 | 10 |
| 1 Igranic 400-ohm potentiometer | | 1 | 8 |
| 1 Ready Radio 25,000-ohm resistance with holder | | 2 | 5 |
| 1 Drilled terminal strip, 18 in. x 2 in. | | 1 | 8 |
| 10 Belling-Lee engraved terminals | | 2 | 6 |
| 1 Set Ready Radio connecting links | | 2 | 6 |
| 3 Valves, as specified | 1 | 13 | 6 |
| 5 Lewcos coils (2 No. 50), (1 No. 60X), (1 No. 100), (1 No. 250X) | 1 | 2 | 9 |
| 1 Set Atlas short-wave coils | | 10 | 0 |
| Screws, plugs, flex, etc. | | 1 | 5 |
| TOTAL (INCLUDING VALVES, etc.) | £9 | 19 | 6 |

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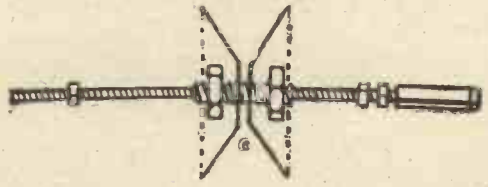

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B.69

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 272.)

quite unable to trace. As it was perfectly fine outside, it did not appear to be due to effects of poor insulation of the aerial. The H.T. battery was a new one, which had been working perfectly well; the L.T. battery had been recently charged, and everything in the set appeared O.K.

"After wasting some considerable time in searching for a fault, I found that I cured it by lightly knocking the side of the L.T. battery. Whatever could have been the cause of that?"

It is almost certain that you had either a loose or dirty contact on the top of the accumulator (if this was a built-up four- or six-volter, comprising two or three two-volt units) or else there were bubbles of gas on the plates themselves.

In the former case it may happen that when you gently knock the accumulator you corrected the poor contacts and brought two clean surfaces into contact with one another, so that satisfactory connection was obtained; but if gas bubbles were causing the trouble it is probable that the gentle shaking released these and enabled the set to function properly again.

### CARE OF THE L.T. BATTERY.

S. M. J. (Coventry).—"I have had the L.T. battery over twelve months, and it has never given the slightest trouble. I notice, however, that the plates are now showing just above the level of the water (acid), and a friend tells me that this should not be permitted, and I ought to put more acid in. Is that a fact?"

If you have not spilt any of the liquid from the cells, but the loss is due to evaporation, it is not *acid* you will have to put back in the cells but *distilled water*. Your best plan would be to purchase a hydrometer (which can be obtained for a few shillings), and find with this the specific gravity of the acid in each section of the accumulator.

The makers of the accumulator will inform you what the exact specific gravity should be, and with the hydrometer you can always be sure of keeping an eye upon the electrolyte. The plates should be kept covered by the liquid, and (apart from spilling) the loss should always be made good with distilled water, which is obtainable at any chemist's for a few pence.

It is not a bad plan to have the electrolyte renewed every couple of years or so (or oftener with a celluloid container), so if you have a reliable service station which will undertake the job, we should be inclined to ask them to do this. Then maintain the level correctly with distilled water, and with the hydrometer keep a check upon specific gravity and charging.

If this is done, you can be sure of getting very long service from your accumulator.

### MILLIAMMETER KICKS.

R. J. H. W. (Solihull, Nr. Birmingham).—"Although very powerful, the tone of the speaker did not seem to be too clear-cut, so a milliammeter was tried in the plate circuit of the last valve. I have been told that if this kicks down I wanted more grid bias, and if it kicked up I wanted less.

"But unfortunately it kicked both ways! What can one do about that?"

You have all the symptoms of overloading, and we should try the milliammeter in the plate circuit of the last-but-one valve, to discover whether it is perfectly steady there, or if the loading is only in the last stage. If you get slight kicks in the last-but-one stage, your input is too great, and you should introduce some form of volume control to enable the signals to be reduced to the point where overloading ceases.

If the kick is taking place only in the plate circuit of the *last* valve, you can either use a valve with a bigger grid swing there, to handle greater volume, or else increase the volume-producing power of your present valve by increasing its H.T. (and negative G.B. to correspond).

Suppose, for instance, you are using a power valve with H.T. plugged in at 100 on the battery. The makers of your valve may show on its characteristic curve that 120 volts may be applied to its anode, which usually means that the battery plug can go up to about 150 (as a certain amount of voltage is dropped across the output).

Be sure, however, to increase the negative grid bias correspondingly, or you will damage the valve.

If, on the other hand, you are already using the maximum voltage recommended by the makers of the valve in question, you must not increase this greatly, although a small increase might be sufficient for your purpose. An extra 20 or 30 volts on the anode would probably do no harm, but if still insufficient when used with its correct negative grid bias you will have to be content with a smaller input strength, or get a larger valve—i.e., a super-power valve instead of a power valve.

### COILS FOR THE "MAGIC" THREE.

The mention of "Tunewell DX" coils on page 208, "P.W." May 3rd issue, really referred to Tunewell D.R. coils. ("DX" coils are not made by Turner & Co., but by DX Coils, Ltd., of 542, Kingsland Road, E.8.)

### SHORT WAVES AND EXPLORERS.

"EXPERIMENTER" (Ipswich).—"Although only 15½ I am already pretty good at the Morse code and can take down anything up to 26 words a minute. Plain language faster. I am very interested in the short-wave working from the Byrd expedition to the South Pole. Are there any others like this to listen for?"

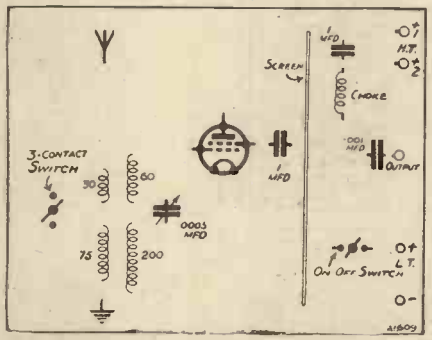
There are several interesting expeditions working on short waves at the present time, including the s.s. "City of New York," which is Commander Byrd's Antarctic expedition, homeward bound from Dunedin, New Zealand. The vessel left New Zealand on April 1st, and works on 34·05 metres under the call-sign W F B T.

In addition there is I P H working on a wave-length of 41 metres. This expedition is exploring the jungle and expects to return in June. It works regularly with Los Angeles at 6 a.m. and 6 p.m P.S.T., which is eight hours slower than Greenwich time.

Another expedition is the yacht "Betty R." which has been in the vicinity of the Bahamas, but whose movements at present are somewhat uncertain. It works on 54·3 and 87·8 metres. Call-sign K D T F.

Another American expedition is the plane No. 476, call-sign W 2 B Q, wave-length 40 metres. This 'plane is on a trip from New York to Columbia, Equador, Peru, Chili, Argentine, and Brazil.

## POPULAR "WIRELETS" No. 10




**Here are the "components" for an S.G., H.F. stage, with switch to change the wave-band. Can you "connect up" the circuit?**

**(Look out for the answering diagram next week.)**

## WHERE CONSTRUCTORS GO WRONG.

(*Continued from page* 259.)

everything is wrong—choice of some of the components, lay-out and wiring.

Of course, this one-valver wouldn't work—and there are few "P.W." readers who would expect it to. But a one-valve circuit is a simple sort of affair and, generally speaking, one can take a few liberties with it and still get good results.

Had the "deviation from specification" of this "Magic" One stopped at a slightly altered lay-out all might have been well.

But it is a very different story with a multi-valver, where there is a little group of inter-connected circuits all playing their parts in the general scheme. To alter the position of one component might upset things.

Now it is quite a fact that we have come across "Magic" Two's and Three's that have been quite as bad as the "One" I have been referring to. And there wasn't a chance that they could work properly.

**100% Successes.**

I have singled out this "One" quite haphazardly, and I trust that the constructor concerned will forgive me—no one need ever know his name for I trust that the "evidence" has been dismantled by now!

A radio set is a scientific instrument, and you have to obey certain specific scientific laws when you build one—if you want good results.

That the vast majority of constructors realise this is, I repeat, proved by the enormous success achieved by the "Magic" range of receivers.

It is to the minority that I have addressed these few words in the hope that we can get pretty close to the ideal of 100 per cent of successes.

There is no reason at all why we should not.

## FOR THE LISTENER.

(*Continued from page* 258.)

tree, and it was mighty interesting. But I'm bound to say that the birds I am mostly watching just now are the little devils who are battening on my seed beds in the garden, and keeping their bright eyes on my rows of peas.

I love bullfinches, and think murder against them many times a day! I feed birds all the winter, and they rob me all the spring! It is enough to destroy one's faith in the Moral Order of the Universe.

**Happy Music.**

I really mean Puccini's "Gianni Schicchi" which I cannot pronouce but thoroughly enjoyed. It is a jolly story of how Gianni impersonates a deceased relative and makes a will in his own favour, that his daughter Lauretta may wed her lover and be happy ever after.

The sort of story that could only come from Florence where Boccaccio wrote his tales. And the music is so gay and bright, and bubbling over with fun and laughing triumph. And in her song recital, Elena Gerhardt sang divinely; and I loved her because she sang first of all my favourite song, Schubert's "An die Musik."

Too lovely! And every night, save one, I have listened to Kathleen Murray and Phyllis Macdonald playing Haydn's Sonatas for violin and piano. That is happy music, too. I have listened also, of course, to the Covent Garden Opera, and had my soul deeply stirred; but I don't think much of my soul now, and it's happy music that pleases me!

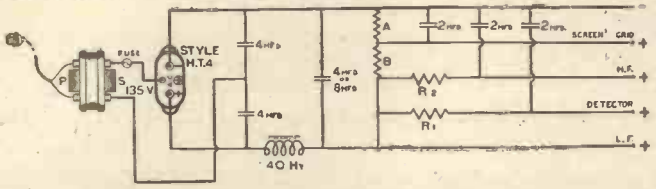
**Gas.**

Mr. A. J. Alan's story had the weird title "CO2, C2H4, O2, CO, CH4, H2, N2." You heard it, of course. It was about gas, and attempted suicide and attempted murder, and all through running after a cat into a neighbour's garden.

Not perhaps one of Mr. Alan's best, but good enough to satisfy his innumerable "fans." "Ladies and Gentlemen, Mr. A. J. Alan," said the announcer—like an auctioneer introducing the prize bull to the

(*Continued on page* 276.)

# The circuit——




**for a high-tension eliminator**

which will give 30 milliamps at 180 volts, or 50 milliamps at 150 volts, with full-wave rectification.

**It is built up round the**

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*Radio Division,*
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*Showrooms in all the Principal Towns.*

**EDISWAN** V.36

## FOR THE LISTENER.

(Continued from page 274.)

buyers ! He shall have my money, anyway. I wouldn't miss one of his quiet sharp little thrills, not for ninepence !

**Grand Slam.**

The B.B.C.'s itch for instruction runs now to Bridge. You have to sit up rather late for Mrs. Stafford Northcote, but she's worth it. She has been worth precisely eighteen-pence to me so far ; and it would have been twice that if only my partner had had the sense to listen-in !

I hope now that we may have a series of "Golfing Tips" (one on "How to get out of a Bunker" would lend itself to noise effects !) And what about Betty Nuttall ? I see she is to appear in the "Week's Good Cause" department, which seems a horrible waste of talent ! I don't object to B.B.C. instruction nearly so much when it's a matter of games.

**Entente Musicale.**

Listening to the "vaudeville of many countries" the other night, I concluded that German is the perfect language for syncopated songs. Greta Keller, with her low snoozly voice, was very attractive. She was new to me. Savoy Hill might do worse than keep her until she is old !

I would like to make these meteors into fixed stars. The Bayan Singers (Russia) are a wonderfully balanced group of voices. Wish Wynne stood for us among this international galaxy, so we weren't by any means among the "also ran."

# A SELECTIVE SYSTEM.

SOME few months ago an announcement was made in this journal and in the press generally concerning a new development in radio science, namely, the Stenode.

The claims made were that the selectivity of a receiver could be enhanced to a degree hitherto unknown in wireless reception. We are now able to place before "P.W." readers the results of a practical test made at the Stenode Radiostat Corporation's Laboratories.

**The Circuit Used.**

The receiver used for the demonstration consisted of a sensitive super-heterodyne in which a condenser bridge arrangement incorporating a quartz crystal immediately preceded the second detector. The circuit was adjusted so as to pass only a very narrow band of frequencies. The output from the second detector was then led into a specially corrected L.F. amplifier, arranged to amplify the high notes to an unusual degree, thus an apparent falling off on the upper musical register, produced by the selective filter, was corrected in the L.F. amplifier, and the proper proportions of high and low notes preserved.

The loud speaker was a first-class moving-coil unit.

Now for the results. Stuttgart was separated from the 356 Brookmans Park transmission, and Manchester was received free of interference from Toulouse. There was no trace of the bad heterodyne whistle, which could be heard on a second 2 H.F. receiver in use in the laboratory.

**"Separated With Ease."**

The selectivity of the Stenode was such that many other badly heterodyned transmissions on the medium wave-band were separated with ease and brought in without a trace of interference.

In another test, a small transmitter in the laboratory was operated to give an imitation of an oscillating next-door neighbour. The violent howls could not be heard at all when the Stenode receiver was tuned to 2 L O, but on the second receiver, which was of the normal broadcast type, the interference was indescribable.

There is no doubt that the Stenode equipment used for the demonstration was capable of giving a wonderful degree of selectivity and a freedom from interference of an exceptionally high order. The quality of reproduction on the moving-coil loud speaker was distinctly good.

**Very Convincing.**

The particular arrangement of the Stenode used for the demonstration was not of a type which the average broadcast listener can afford. The combination of super-heterodyne, quartz crystal and correction amplifier is necessarily somewhat complicated and expensive.

However, as a laboratory demonstration the results were very convincing.


SCRAP YOUR OLD AERIAL and fit the 'GOLTONE' NO-MAST AERIAL

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Your signal strength can be nearly doubled, selectivity vastly improved, and stations hitherto unobtainable come in at loud-speaker strength with the "Goltone" No-Mast Patent Aerial.

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No other Aerial Wire required. *From all first-class Radio Stores*

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Mr. W. D., Brian Avenue, Marino, Dublin.
"I am very pleased with the 'Goltone No-Mast Aerial.' I have obtained increased selectivity and more volume, and received foreign stations which were unobtainable with old pole aerial.
"I shall recommend it to my Wireless friends."

Mr. G. J. R. T., Shorts Garden, London, W.C.2.
"Many thanks for aerial. Rather sceptical, but results all you have claimed it to be."



Who was "M"?

That was the question Buddy Drake asked himself. Asked again and yet again, but could not answer. "Dearest," the note had run, "I must see you. Let me know where and when. It's awfully urgent.—M." Meant for his twin brother, Atherton, of course. But then Atherton was dead, and he, Buddy, had taken his place. Just as he had taken his betrothed all those years ago. Well, he must see it through. Yet he felt afraid. You must read "The Shorn Lamb,"

A NEW NOVEL by W. J. LOCKE in the

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# TECHNICAL NOTES.

By Dr. J. H. T. ROBERTS, F. Inst. P.

### Long and Short Waves.

I HAVE been asked at different times why it is that a distant long-wave station can sometimes be received at quite good strength whilst a nearer medium or comparatively short-wave station is subject to fading.

Before giving the generally accepted explanation of this effect, I should say that all such effects are still somewhat imperfectly understood, and no really hard-and-fast rule or even complete explanation can generally be given.

The commonly accepted view, however, is that the variations in strength are due to reflections of the waves from ionised regions in the upper atmosphere. It is in accordance with this theory that longer wavelengths should be less affected than medium and short wave-lengths.

The effects in question will vary from night to day and, in fact, will vary from hour to hour. One of the advantages of long-wave transmission, in fact, is its comparative freedom from variations of this kind, and this has to be off-set against the well-known advantages of short-wave transmission.

### How Talking Pictures are Made.

There are two main systems of talking pictures, the sound-on-film and the sound-on-disc systems. There are advantages and disadvantages of both systems.

One of the advantages of the sound-on-film system is that the synchronising is automatic, in the sense that if the film is broken, or if any portion of it is cut out, the sound is automatically cut out with the pictures and it is impossible for the sound track to shift in relation to the picture.

### Photo-electric Pick-up.

As a matter of fact, slight adjustment of synchronisation is possible by the shifting of the photo-electric pick-up in relation to the "gate," but once the correct position is found the synchronisation should be retained indefinitely.

There are other advantages connected with the convenience of the producer in the studio; but it would take me a long time to go into these and it would involve a more or less detailed description of the way in which different types of "sets" are filmed.

I may say that amongst professional film producers the sound-on-film system is more in favour than the sound-on-disc, mainly for the reasons I have just indicated, and therefore it may be expected that for full-scale professional work sound-on-film will hold the field.

### Question of Cost.

But when we come to the question of the smaller cinemas the position is entirely different. Here the question of "producing" does not arise, and in any case the talkies can be made in the sound-on-film system in the first instance and, if desired, the sound can subsequently be re-recorded into the disc system.

(*Continued on next page.*)

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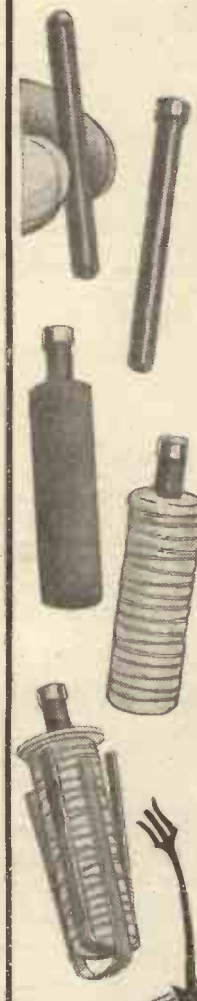

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The exact opposite is the case. Study the pictures on the left and you will see how really simple it is.

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"*Popular Wireless*," 17/5/30.

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## TECHNICAL NOTES.

*(Continued from previous page.)*

Sound-on-disc, so far as the reproducing machines go, is very much cheaper and simpler than sound-on-film, and that is why it has a very great deal to recommend it for use in the smaller cinema theatres, halls, and so on, where expense is an important consideration.

Of course, as I have said, it is quite a simple matter to retain the advantages of both systems, where they have advantages, because the original recording can be made in the sound-on-film system and then, when the picture has been cut about and reduced to its final form for release, the sound may be re-recorded into the disc system for use on existing sound-on-disc machines.

### Anode-Bend Detection.

I suppose there are a large proportion of experimenters who regard the leaky-grid method of detection as being in the nature of a standard, and the anode-bend system as being by way of a variation not to be regarded too seriously.

It is true that often enough the anode-bend detector cannot be made to operate as well and as reliably as the leaky-grid, and this causes many people who try it to revert to the leaky-grid method, with a determination to stick to it.

As a matter of fact, it may be that the anode-bend method of rectification has not been properly tried out, because you want to make sure first of all that the valve which you use is a suitable one for the purpose.

There are many valves which are unsuitable for this purpose, and if you happen to try the anode-bend method with such a valve you may well get the impression that it is inferior to the leaky-grid system.


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A new circuit, amazingly selective, easy to build, and staggeringly sensitive!

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**PRICE 1/-**


### Anode-Current Grid-Voltage Curve.

If the curve which shows the relation of anode current to grid voltage has a short curved part, the valve may be suitable for anode-bend rectification, but if the curve is long drawn out at its lower part, the valve will be unsuitable.

If you are not able to obtain the curve from the manufacturers it is quite a simple matter to plot it out by experiment.

### Variations in Valves.

The curve as given by the manufacturers will, of course, be the same for all valves having the same specification, but in practice you will find that they do not by any means all have the same characteristics, and they may vary considerably from the specification.

*(Continued on next page.)*


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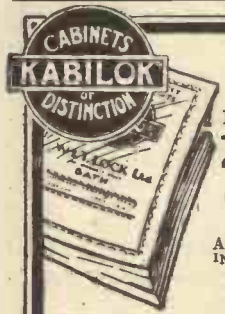


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THE PICTURE PAPER WITH THE MOST NEWS
**—SUNDAY GRAPHIC—**


# TECHNICAL NOTES.

*(Continued from previous page.)*

However, having got a valve which is more or less suitable you can, as a rule, get satisfactory results by careful attention to the value of the grid-bias and the high-tension voltage applied; in fact, this precaution is necessary no matter how well adapted the valve may be.

The point I want to make clear is that you should not condemn the anode-bend system of rectification merely from one or two trials with any old valve which you happen to pick up; in order to make a reliable comparison you want to be sure that you have each of the two methods in operation under the appropriate conditions.

### Power Transformers.

In all-mains sets, or those in which a single power transformer is used for the supply of both the H.T. and the L.T. currents, an important point arises which is often overlooked by experimenters, sometimes with unfortunate results.

I refer to the voltage output of the transformer under partial and full loads. The load will consist, of course, partly of the H.T. and partly of the L.T. currents, and you must remember that if either of these loads is removed, the voltage on the other circuit will rise to a greater or less extent

Therefore the conditions should be adjusted so that the correct voltage output is obtained when both circuits are in operation and care should be taken that no excess voltage is thrown upon either circuit due to the other one being idle.

### "Regulation."

These transformers are only very small ones, as transformers go, and as you know, it is not at all easy to ensure good "regulation" in a small transformer.

Regulation is the property of the transformer by virtue of which it maintains its output voltage at a constant figure irrespective of variations in the load.

With large power-transformers, "regulation" is as a rule exceedingly good, but with very small ones it is often rather poor, and consequently the output voltage varies considerably with the load.

So long as you bear this in mind and take the necessary precautions no harm need result, but it is not sufficient just to test the output voltage in certain conditions and then to assume that it will always be the same when the load conditions are varied.

### Land-line Transmission.

Although people often criticise the quality of broadcast transmissions which have been sent from one station to another *via* land-line, it should be remembered that the land-lines used for the purpose were never intended to be put to such exacting tests as those which are involved in broadcast transmissions.

In some of the new land-lines which are being laid, special provision is being made for high-quality speech and musical transmissions, which mean, in effect, that the lines are designed to carry a very wide range of frequencies.

Before the advent of broadcasting the Post Office engineers had to consider merely the "intelligibility" of speech, and

*(Continued on next page.)*


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*for the*
**MULLARD "MASTER TWO"**

THE LOTUS PANEL ASSEMBLY

Specified by the makers of the "Master Two," the Lotus Panel Assembly consists of a combined single drum dial and condenser and a separate reaction condenser, all mounted on a handsome black finished aluminium panel, with silver oxidised escutcheon plate.

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## IS THE NEW PLANET INHABITED?

The new planet beyond Neptune was only discovered a few weeks ago, but already all sorts of speculations and discussions are taking place round it, and one of the latest is the question of whether it can be inhabited.

In to-day's issue of THIS AND THAT, Mr. George F. Morrell, Fellow of the Royal Astronomical Society, discusses the matter, and gives some very interesting facts bearing upon it.

## A FUTURE BRITISH NIAGARA

The Government has decided to undertake a further investigation into the question of setting up a huge power station worked by the tides in the mouth of the Severn.

There are many who advocate this scheme, and believe that if it were carried out power could be produced far more cheaply than it is at Niagara.

The whole question is discussed and many interesting facts are given about the possibilities of the great scheme, in a grand article in to-day's

# This and That

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## TECHNICAL NOTES.

(*Continued from previous page.*)

provided intelligibility was obtained, they naturally did not go to unnecessary expense in obtaining the last fraction of "quality."

However, when the lines are to be used for the transmission of radio programmes, an entirely new set of conditions arises and mere "intelligibility" is not sufficient; the question of "quality," in fact, becomes extremely important.

Furthermore, the sounds which are to be transmitted are of almost every kind, and therefore very special precautions have to be taken to ensure the faithful carrying of the wide range of acoustical frequencies involved.

### Importance of Quality.

It has long been known that the main frequencies involved in intelligible speech are somewhere below 1000 vibrations per second, but even for reasonable quality it is desirable to carry frequencies up to, perhaps, 3,000.

For broadcast purposes, however, it is important to carry frequencies of 5000 or even up to 10,000 and the special lines which the Post Office are laying are designed with this object in view.

In the future, therefore, it should be possible to transmit programmes by land-line over long distances, and eventually to broadcast them from local stations, with virtually the same quality as though they had been transmitted direct by radio without the intermediary of any land-line link.

## TECHNICAL TWISTERS

No 10.

### THE GRID LEAK DETECTOR.

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For ordinary G.L. detection the leak's "return" should be connected to the . . . . . end of the filament.

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Changing the value of the grid leak will often improve the working of the . . . . . control.

A wrong value of grid leak is sometimes indicated by a regular . . . . . .

In short-wave sets the G.L. return is generally taken not direct to filament, but to the . . . . . of a . . . . . .

Last week's missing words (in order) were :—Low, Capacity ; Fewer, Secondary ; Magnetic ; Earth ; Spaced, Interaction.


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Hand Type.

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Pedestal Type.

Highly Sensitive Microphone as above described, provided with detachable sound collector and a 9 ft. silk connecting cord, but fixed by rubber-cord suspension in nickel-plated frame on pedestal 11 in. high; for mounting on Speaker's Platform, in Pulpit, on top of Camera Stand, or for suspension from ceiling, as illustration ... ... ... 25/-

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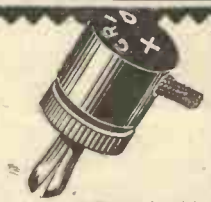

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## USING SAFE-POWER UNITS (See Page 285)

# Popular Wireless

Every Thursday PRICE 3d.

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## An Efficient One Valver

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## FULL DETAILS INSIDE

*Other Special Features In This Issue.*

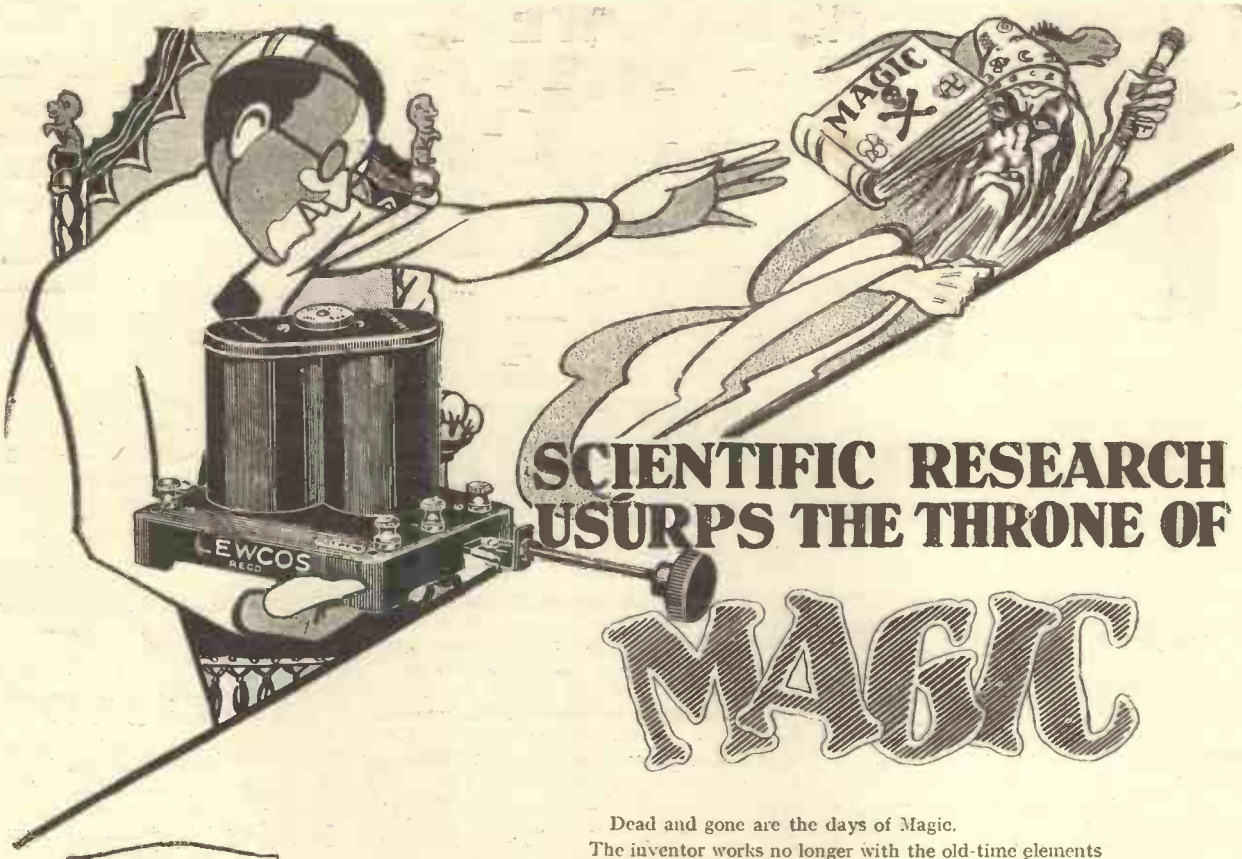
In Berlin With a "Fernempfänger."

Notes From The North.

FADING (II). By Capt. P. P. Eckersley, M.I.E.E.

Grid-Bias and Your Pick-Up.

Short Waves On Ordinary Sets.




# SCIENTIFIC RESEARCH USURPS THE THRONE OF MAGIC

Dead and gone are the days of Magic.

The inventor works no longer with the old-time elements considered necessary in the art of creation—those unknown qualities which were assumed to be the stock-in-trade of magicians.

In these days the basis of invention is scientific research—definite knowledge of every small detail, every element which ultimately constitutes the finished article.

It is on this basis of scientific research that the work of the Lewcos Laboratories is carried on—hence this firm's world-wide reputation for "perfection in every detail."

The Lewcos Dual Range Binocular Coil, illustrated above, is designed to meet the demand for high efficiency astatic or field-less coils, having wave-length ranges of 235-550 metres and 1000/2000 metres, the wave-length range being selected by a simple push-pull switch which protrudes through the receiver panel. Three types are manufactured, as follows:

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A special switching mechanism can be supplied so that one or more coils can be mounted on the baseboard of the receiver with switching mechanism parallel with the panel. Price 3/- (Reference S.M.5).

A specially-written leaflet on this marvellously efficient Coil will be sent on request. Please quote Reference No. R.55.

**LEWCOS DUAL RANGE BINOCULAR COILS HAVE BEEN SPECIFIED FOR THE "REGIONAL 4" DESCRIBED IN THE MARCH 1st ISSUE AND FOR "TWIN WAVE 3" DESCRIBED IN THE JANUARY 11th ISSUE OF THIS JOURNAL.**

# LEWCOS (Regd.)

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MANY INVENTIONS.
PORTABLE EARTH.
BOYCOTT CLUB.
THE AWFUL TRUTH.

# RADIO NOTES & NEWS

REAL RADIO THRILL.
HELPFUL HINTS.
ANOTHER SUGGESTION.
AMERICA AND OIL.

### The Opening Shot.

THE place of honour this week goes to R. D. (Truro) for his letter about the "Magic" Three. It is a model—the sort of thing that causes an editor to relax, and allow the wraith of a smile to play for a few seconds over his granite features. On reading the letter, one of the Research Department fellows became positively hilarious—for a Research man—and, I am sorry to say, even went to the extent of asking Mr. Rogers a riddle, "When is a door not a door?" Absolutely drunk with joy, you might say, though such displays of de-control are rarely seen in our office. If these Research people cannot maintain a firmer grip of their emotions, all I can say is—— Oh, about this letter. Well——

### Right First Time.

FIRST of all, R. D. says that he feels he cannot hold back any longer his opinion of the wonders of the "Magic" Three. Quite right, too. We don't want an explosion in Truro. He had never before made a set, and his luck led him to try the "Magic" as a start. Something uncanny about that. Of course, the thing practically made itself, and has brought in fifty stations of which forty were received at good L.S. strength. Finally, he thanks those researchers for a "very selective and inexpensive set," and signs himself, "Your very satisfied reader." Good man. I hope Trelawney will live for ever.

### Many Inventions.

THAT little monthly, "The Inventor," is really a stimulating morsel, though as its Editor is a heaven-sent target for every mad inventor in the world, I feel sorry for him. In my own editorial days some of the letters which I received caused me to break into a prickly perspiration at the thought of their writers being at large. One amusing "invention" referred to is "bringing the dead to life by machinery." By the way, Marconi's Genoa experiment is made the subject of an article called "Marconi's New Invention." Let our esteemed contemporary beware of sensational journalism. What new invention does Marconi claim?

### Needles, etc.

MY kind Dover correspondent, S. M. F., in order to seduce me from my allegiance to fibre needles, has sent me a fine collection of steel "pins." An amazing variety of shapes. Some apparently gilded, too; I looked in vain for a diamond-studded specimen. I am trying some of them with discretion, but none has been found to be scratchless—like fibre. I want to be let into the secret of hardening fibre needles, please. I feel sure that there *is* a secret practice amongst users of them. S. M. F. has given me a few more stories of the "experts," for the truth of which he vouches.

## ALL READY FOR THE BIG BANG!

Here is the "effects" department of a German station getting ready to put over an earthquake! In the foreground is an ear-splitting rattler, and behind it the revolver-and-bell-ringing man. Three people are holding boulders to hurl down the wooden shute, and the others are standing by ready to make a little more row, if required!

### A Portable "Earth."

S. M. F. states that a local expert told someone who asked about "earths" to fill a wooden box, 2 ft. by 2 ft. by 1 ft. with earth, and stand it not less than 4 ft. away from the receiver, connect a piece of 18 S.W.G. D.S.C. wire from "E" terminal to the earth in the box, and keep the mould in the box moist. As the novice was unable to procure the correct size in boxes he has had to give up radio. The same "expert" is said to have told another customer to knock a *copper* nail into the *bricks* of the house wall in order to get a better "earth" than that provided by the water-pipe. He seems to have had grave doubts as to the conductivity of lead.

### Exide Service Convention.

HOW one solitary service agent, representing the Exide people in 1920, grew to be a convention of 581 is the story behind the banquet which is to be held on May 28th, at Edinburgh, when the Exide Service Convention will celebrate the occasion. Many people imagine that the "follow up" service idea was imported from America, but it's hard to think of something sterling which has not already been practised at some time or another since the days when we became a nation. "P.W.'s" best wishes go with the Exiders on their little jaunt to Auld Reekie.

### How the Others Do It.

THE other week I gave a few examples of how the radio critics in India get to work. Now here is the Australian: "May Foulder warbled a violent tremolo on the constricted high note which coincided with 'sunroise.' The interlocutor made talk between items in the hope of eventually making a joke."

"Mr. O—— K—— gave a poor account of the 'Sea Gypsy,' and his 'Casey the Fiddler' was not sung by *my* request."

"When listeners tune in to a 'Classic Hour' they do not expect to hear a saxophone playing a Chopin nocturne to a harp accompaniment."

### A Boycott Club.

ARISING from our recent Editorial about the row in Birmingham is a suggestion by L. W. (Airdrie) for the formation of a club out of whose funds would be paid the fines of members who refuse to pay their licence fees. Fascinating, but not feasible. If the members pay to the club ten shillings per annum they might just as well pay it to the Post Office; and in any case, that would not be enough to pay all the fines, which invariably exceed ten shillings each—and who are to be the favoured ones who are to be allowed to defy the law at the expense of the club?

### The Awful Truth.

IT'S no use blinking the fact that many people are still willing to risk the disgrace of a prosecution, and the

(*Continued on next page.*)

# NOTES AND NEWS.

(*Continued from previous page.*)

possible penalty of conviction, for the pleasure of trying to dodge a tax of 10s. per annum, though they will cheerfully listen to the "broadcasting" for hours daily, probably having declined to buy a set and having made one up without a thought about patent rights. A sad picture!

The B.B.C. reveals the striking fact that the number of "pirates" successfully prosecuted by the Post Office for the evasion of the licence fee works out at *three per weekday* since October, 1925, to the present time!

### Club Note.

I AM pleased to devote a few lines to a notice about that progressive body, the Croydon Wireless and Physical Society, which is as healthy as ever. Particulars of its membership, etc., may be obtained from its Hon. Sec., Mr. H. T. P. Gee, Staple House, 51/52, Chancery Lane, London, W.C.2. Visitors are cordially invited to any of its meetings and new members confidently awaited.

### The Common Plight.

AS a result of my note about the unfortunate possessor of an obsolete but expensive set, who was finding it difficult to get valve renewals, I have received offers of valves of so many types that if these museum pieces were brought together they would form a valuable collection. Will all concerned accept my hearty thanks and forgive me for declining to act as curator—or purchasing agent. On my advice my friend has decided to "write off" his set and invest in a modern receiver, but he is charmed to know of the army which hastened to his assistance, and so am I. M.G.

### Real Radio Thrill.

THOUGH not of such heroic timbre as others we have heard, that S.O.S. requesting the lady not to take the granulated powder was in my opinion fundamentally the most thrilling of all. Think of that lady with a packet of deadly poison, the intention to take a dose in ignorance of the danger; getting the glass and spoon—and then being diverted from the job by some trivial matter. And all the while the Truth, like a flood, seeking her out, rushing overhead, passing through her very body, becoming known to thousands helpless to help her. Her friend in Germany might hear it, or some relative in Egypt—yet again she takes up the spoon . . . !

### Stenode Radiostat.

IT is now possible to examine the theoretical diagram of Dr. James Robinson's new type of receiver which is said to be far more selective than any ever before designed, and it is interesting to find that quartz crystal is employed as a frequency filter. I hear good reports of the demonstrations and I sincerely hope that the invention will live through the ordeal of examination by commercial engineers—the acid test—for the results at which it is aimed are most beneficent. What worries me is that, apparently, for the Stenode R. to function properly the frequency of the transmitting station will have to be absolutely unvarying. I hope, however, that I am in error.

### Helpful Hints.

FROM the "Daily Herald": "How long should an accumulator last?" asks A.B.C., Wandsworth. "You should get 80 hours' use from your battery before it needs recharging." From the "Derby Daily Express": "The flow of electric current through copper wires causes chemical action, and this in turn causes the surface of the wire to become coated with a deposit that acts as an insulator." Can any one say what chemical action is set up in a copper wire by a flow of current through the wire, please?

### Six-Pin Coils.

REFERRING to Mr. S. R. Phillips' letter in "P.W." for April 12th concerning six-pin coils for the "Magic" Three, we have received a number of inquiries about the windings of these coils. Would Mr. S. R. P. oblige other readers by sending his constructional data to the Editor?

## SHORT WAVES.

"Broadcasting is not what it was."
No; everyone knows it for what it is.—
"Pictorial Weekly."

* * *

Little Jack Horner sat in a corner,
Eating his Christmas Pie.
He put in his thumb
And pulled out two Synthetic Crystals
And a Patent Terminal,
And said: "This is what comes of having
A Publicity Agent for a cook."
—"Wireless Trader."

* * *

It is stated that the Americans are undoubtedly the best broadcasting announcers. Broad-ly speaking, yes.

* * *

EXPOSED WIRING IS SOMETIMES SHOCKING.

Bartlett: "Why don't you electrify your set?"

Smartlett: "Oh, Heavens, I did! But my wife says that if I ever tell another story like that one, we won't be invited again."—"Radio News."

* * *

"It is interesting to reflect that the B.B.C. will undoubtedly one day have its museum. What will it contain?" we read in the "Daily News."

We understand that so many scathing replies have been received to this query that it was impossible to publish them.

* * *

"We learn that many radio clubs are 'feeling the draught' owing to lack of support," writes a contemporary. That must be those wireless "fans" at work again.

It is most gratifying to us to observe the keenness with which technical matters are followed and pounced upon by our readers. After all, "P.W."-ites are really nothing but a jolly Radio Club—the biggest in the world!

### "Magic" Wave Changing.

QUITE a lot of interest has been evinced in this matter, which was dealt with in our issue of April 19th, and much ingenuity has been displayed by readers in producing variants of the scheme. That is all to the good, and we are happy to be able to stimulate the spirit of invention. J. G. (Newport, Mon.) deserves a special word of acknowledgment for his device and letter, for which he has our thanks.

### Cutting 'Em Both Out.

MR. HENNEQUIN'S appeal for a method of cutting out 356 and 261 metres brings a letter from S. E. D. (New Barnet), who recommends him to try the rejector portion of "Reg the Nat." (see "P.W.," February 8th). S. E. D.'s coils consists of 55 turns on a 2½ inch former 3 inches long, 24 D.C.C. wire, Formodenser, G type, and Lissen 0·0005 mfd. fixed. The method of operating is, says S. E. D., as follows:

### Working the Rejector.

"TO set the rejector, tune-in 356 metres and note the dial reading; then detune by raising the reading 3-5 degrees. Now fit the rejector and slowly screw down C3 about three parts of the way in. Next, screw down C4 until the 356 transmission disappears. On increasing reaction the 356 may be heard slightly in background, but you will be able to tune him out. Now turn to the dials on the set and you will find the foreign stations. Remember, however, that the tuning is very sharp with the rejector in use."

### Another Suggestion.

M. G. (Dalston) suggests the use of the "Brookmans Park Rejector." His plan is that Mr. Hennequin should fit two of these in series, one being adjusted for the "Nat." and the other for the "Reg." If this scheme fails, M. G. says that all he can recommend is a portable—gramophone! But what about the "Twin-Wave" Brookmans Rejector described in "P.W." No. 398?

### The Wonder Yacht.

MARCONI-HUNTING is becoming a select cult nowadays, and I am sure that all ears aboard the "Elettra" would burn if their owners were to realise the amount of concentrated searching which is going on in the ether with the yacht as its objective. J. O. (Leith) reports picking her up whilst she was working with New York; 26 metres. I suppose that many of you heard the American re-broadcast of Marconi's speech which he made to New York by means of his new radio-telephone equipment?

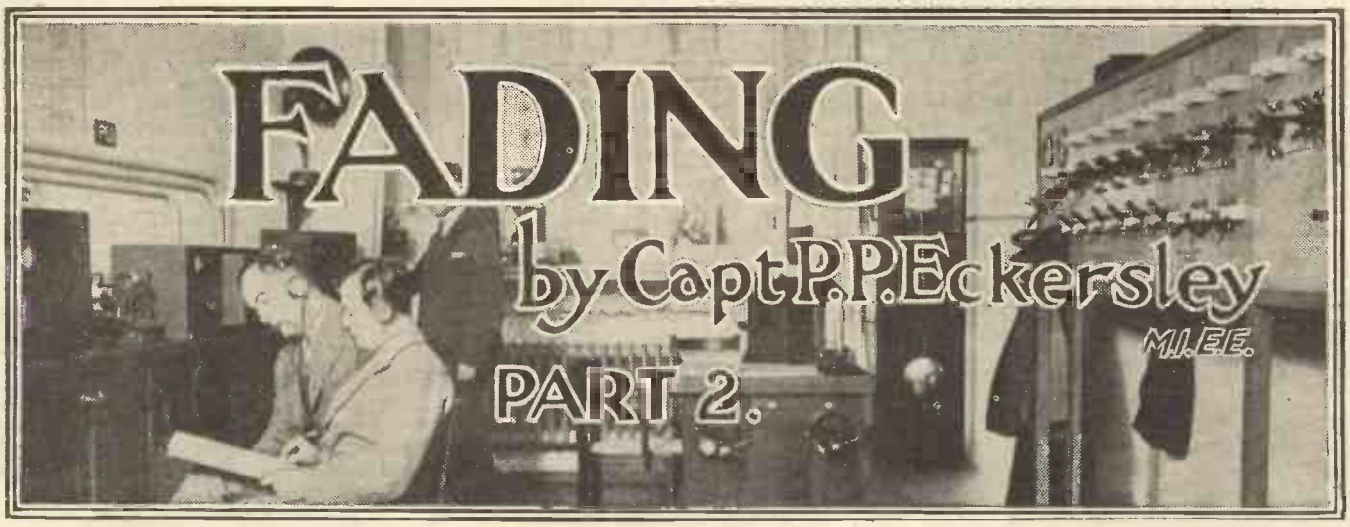
### America and Oil.

THE U.S.A. authorities have decided to encourage the search for oil by giving facilities for radio oil prospecting to all responsible applicants. The Federal Radio Commission has allotted five frequencies to this work. In the exploration for oil a radio signal is transmitted simultaneously with the detonation of a subterranean dynamite explosion. By measuring the time lag between the reception of the radio signal and the sound of the explosion, it can be determined whether oil deposits are present between the transmitter and receiver.

### Checking Up the Czechs.

ACCORDING to the latest returns there are in Czecho-Slovakia approximately 284,000 radio receiver licenses in force; this represents 2·4 per cent of the total population. It is astounding to learn that 67 per cent of the sets in use are "crystal." However, this little country is up-to-date in the way it issues free licenses to the blind, the totally disabled, and certain schools; all quite right, no doubt, but if the world encourages the "conscientious objector" I foresee the application of the principle to the payment of taxes and licence fees.

**ARIEL.**



# FADING

## by Capt P. P. Eckersley M.I.E.E.

## PART 2.

**In this concluding part our Radio Consultant-in-Chief summarises the causes of fading, and discusses the proposals he has laid before International Committees regarding the re-allocation of wave-lengths to commercial and broadcasting stations in order to improve conditions for listeners.**

IN my last article I showed a picture of waves leaving an aerial. I reproduce the picture in Fig. 3. There is a ground ray A—G and space waves hitting the underside of the electrified layer and coming to earth again. The ground ray gets feebler more quickly than the space ray, and gets feebler quicker as the wave is shorter. In Fig. 3 it is supposed to be practically zero at G. We draw from this theory some interesting facts:

### What Happens?

(1). From A—S6 we get the direct ray predominating, and therefore the signal never goes to zero. A to S6 represents the service area limit in one direction.

(2). From S6 to S8 we have a section where intolerable fading sets in, due to complete cancellation of direct ray by space ray.

(3). Past S8 we get pure indirect ray reception and less, but some, fading.

The points (1), (2), (3) show why, if not listening to the local station, it is better if perfect reception is wanted to listen to a *very* distant rather than a *moderately* distant station.

(4). The distance at which intolerable fading starts is independent of the power of the station. Because if we were to quadruple the power of the station, and therefore double the strength of the waves, we should double the direct ray and double the indirect ray, and these would cancel each other at the same distance from the station, whatever their strength. On the other hand, a higher-power station produces a stronger indirect ray, and so is heard further away, due to an *absolute* gain in strength.

### Dependent on Wave-length.

(5). The distance at which intolerable fading starts is directly dependent upon the wave-length, because the point of intolerable fading is the point where the indirect ray equals the direct. Thus, since the direct ray gets feebler much quicker, i.e. attenuates more rapidly as the wave-length is shorter, the direct ray will only be equal to the indirect much nearer to its point of origin, as the wave-length is shorter.

(6). Since we define direct ray listening as service area listening, the service area limits are directly determined by the wave-length (for a given type of earth), *whatever the power of the station, and the service area is less as the wave-length is less.*

(7). As the direct ray for a given wave-length gets feeble quicker as the ground is more broken (i.e. more mountainous), the service area is determined not by power but by wave-length, and by the type of ground over which the waves must travel.

I was responsible for working out the above theory quantitatively. It is all set out in a pamphlet called "The Calculation of the Service Area of Broadcasting Stations," published privately by the B.B.C. The pamphlet is based upon several papers I have read as author or part author before the Wireless Section of the Institution of Electrical Engineers.

It is perhaps interesting to call attention to various qualitative verifications which must be part of the direct experience of many of my readers.

Firstly it should be made plain once more that the Heaviside Layer, responsible for the earthward reflection of waves of lengths between 200 and 2,000 metres, forms only at night. This at once explains why night time reception is better than daytime.

Furthermore, every one has noticed fading and is probably aware that this is worse from a station, say, 150 to 100 miles away than one much further away. For example, the new London station, working on a wave-length of 261 metres, gives a wonderfully good service (albeit it sometimes fades a little) in Madrid, whereas to my knowledge it gives the most dreadful variable service in Southampton. The 356-metre London station is quite fair in Scotland, but worse in Manchester. 5 G B is good in Northern Scotland, but hopeless in North Wales, and so on and so forth. This all goes to prove my theory.

### Change Over With Ships.

But the job before the wireless broadcasting engineer is to get the widest possible service of the direct ray. He cannot do more than attenuation lets him. He is entirely dependent upon the wave-length allocated to him by international convention.

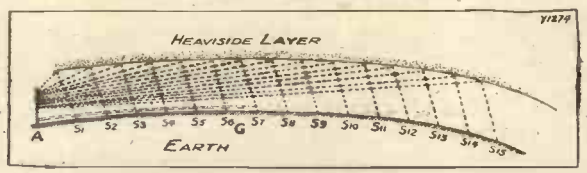
The present wave-lengths allocated internationally to the broadcasting services are much too short. We need waves between 500 and 2,000 metres. Broadcasting depends upon the direct ray, a fading service is not true service. The direct ray service can only be extended as the wave-lengths are made greater; high power is no solution to our troubles.

My proposals, which have been long before the International Committees, involve the swapping of wave-lengths between the ship and aircraft services and the broadcasting services. As to ships, they transmit their waves over the sea. The sea is, to a wireless wave, a smooth surface. The electric waves do not fret themselves away on the sea waves! Thus a 200 metre wave passing over the sea is as good as a 2,000 metre wave passing over quite ordinary open pastoral land. It would seem reasonable to swap, since the ships would be as well off and broadcasting infinitely better off.

### The Case of Canada.

This theory is correct. It has been proved qualitatively and quantitatively countless times. There are, owing to the complete unsuitability of wave-lengths allocated to broadcasting, vast tracts of land all over the world where broadcasting cannot penetrate. In Canada, where they are forbidden to use any long waves, only about eight per cent of the total area of that country can be covered by service area broadcasting. It is time technicians were allowed to settle these matters in terms of technicalities.

## LEAVING THE AERIAL.




The space-waves go upwards, strike the Heaviside Layer and are reflected down again to earth. The Ground Ray traverses the surface of the earth.

# A GROUSER'S GROUSE.

**We receive hundreds of letters a day from our readers, and amongst them are a few which indicate that sets made some years B.C. are still in use!**

**By THE EDITOR.**

LETTERS from readers of "P.W." are always welcome in this office—especially when they are constructively critical. And, as in most newspaper offices, it is the Editor's particular job to keep a pretty close watch on such letters.

Taking it "by and large," we probably receive a thousand letters a week from "P.W." readers. A good many of them are, of course, requests for technical information, and these are dealt with by the Technical Queries Department. Others are letters giving details of results obtained with "P.W." sets, and week by week you will find a selection of them in our correspondence page.

**Just Grousing.**

Now and then, however, the Editor's correspondence includes a letter from a reader who, more often than not, signs himself "grouser." Such letters are put on one side and, when the pressure of other business of the day relaxes, "grouser" complaints are carefully studied and analysed.

Very often such letters offer really helpful suggestions—others, of course, are just—well, just "grouses."

But really, all letters which contain evidence of criticism are extremely useful; by studying them and noting the ideas of readers, much can be done, and is done, to improve "P.W."

The other day we had a long letter from an Edinburgh reader who took us to task for not producing more "inventions." Our "new designs," he went on to say, showed no great improvement on sets which were popular years ago!

Our critic then went on to say that he finds the 1924 reflex design beats all other sets—ancient and modern. He uses a short indoor aerial, gas-pipe earth, foreign valves. In fact, everything theory tells him he shouldn't do, he does!

**"Bluff in the Wireless Trade."**

Indeed, he rather glories in the admission that he uses cheap foreign transformers, "old stock" variable condensers, and other "junk." And he claims that he has never built an "all British" set, or a set with high-priced components, but has stuck to his reflex set.

"I think the best of the British-made sets is not in the sets themselves, but in the advertisements. Profiteering is the Briton's art, unsurpassed by any other nation. 'Rings' and associations to keep up prices—that's Britain: and Bluff in the Wireless Trade."

Well—that's a fair specimen of the nonsense written by this particular correspondent, whose ideas of radio seem to be about on a par with his knowledge of the radio industry. And that's putting it pretty low.

Having built his reflex set, our friend has stuck to it for years. No great harm in that, of course, but when he starts giving his views on modern sets which he has never built and obviously knows nothing about, the criticism he offers becomes rather ludicrous.

Still—the letter we have quoted from is interesting and instructive for this reason: from the details given about the reflex set our correspondent has built—and allowing for its hoary antiquity—we can realise why many listeners in this country are finding the Regional Scheme so exasperating, and why some people complain that no progress has been made in broadcasting technique, both from the transmitting and reproduction point of view.

No doubt some one who bought a motor-car in 1900, and has driven it ever since, without ever trying out a modern car, would hold similar views to those given tongue to by our Edinburgh correspondent, although we doubt whether a 1900 car would have lasted as long, and given as much satisfaction as, apparently, has the reflex set in question!

**The "Stand-Stills"**

Still, just as there are people to-day who think no progress has been made in music since the days of Gilbert and Sullivan, so there are probably some radio fans who still think the coherer the finest detector ever invented.

One day they will get really daring and purchase a 6d. crystal and then the fat will be in the fire! And we dare not think what would happen if the coherer fanatic suddenly went "all out" and purchased a valve!

But joking apart—the moral to be found in the "grousing" letter from our Edinburgh correspondent is this: if you "stand still" in radio you are going to be bored. There's nothing like marking time for monotony.

The chief joy in radio is that the art never stands still. It steadily and persistently progresses, and although some readers may wonder at the large output of "new designs" which regularly appear, and although, on cursory examination, they may wonder where one new design differs from another, the fact remains that almost month by month there is definite advance made in set design.

**Steady Improvement.**

Perhaps the improvement in a June set may not seem so important as to justify the scrapping of the set you made in May, but nevertheless the improvement, the advance, is there.

Not a "revolutionary" improvement, perhaps, maybe a very small, almost insignificant alteration in layout, or perhaps a slight variation in the design of a coil, or a choke. But it all helps, and the improvements made in, for example, a 1930 three-valve set compared with a 1929 three-valve set, total, in twelve months, to quite an important size.

Keen amateurs who realise the steady progress of radio and who love the game for its own sake, and who are not content with a set six or seven years old—made from cheap foreign junk, know this, and appreciate the value and the joy of handling an up-to-date all-British set.

Perhaps our Edinburgh correspondent will realise it—one day.

## AT A TELEVISION DEMONSTRATION

Progress in radio, as in all scientific matters, must for the greater part be gradual. From week to week you may notice little advance, or little that is new, but consider the progress made over a whole year and you will be surprised at the strides made. Television forms a good example of this.

## Radio Wrinkles

**One advantage of the screened-grid valve is that it makes for a great simplification in wavelength changing.**

* * *

**When checking H.T. voltages with a high-resistance voltmeter, remember that the tests should be made after the set has been working for an hour or two, and whilst the batteries are still supplying current, as otherwise the readings will be misleading.**

* * *

**The term "shelf life" as applied to a dry battery is a reference to the fact that such a battery deteriorates in time, even when not in use.**

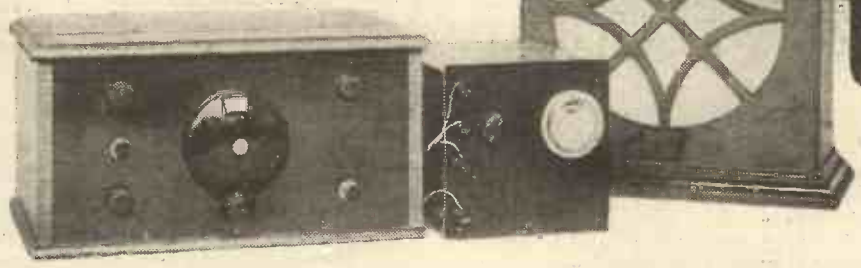
* * *

**Even a "new" H.T. battery has a high internal resistance if it has been kept in stock by the dealer for a long time.**

* * *

**If any of the cells in an H.T. accumulator are sulphated, or if the connections between cells are poor, this type of H.T. supply may give rise to battery coupling and L.F. instability.**

# USING SAFE-POWER UNITS



by G.V.DOWDING
ASSOCIATE I.E.E.

**If you are using or are going to use any kind of mains device, you should read this practical article, which deals with the dangers of mains working. But it also shows you how easily these dangers can be avoided and units and mains sets operated safely and effectively.**

"P.W." has had one of its most successful seasons. The country must be very thickly dotted with "P.W." "Magic" and "Titan" sets, and with "P.W." "Brookmans Rejectors" and "Safe-power" Units! But there is one tiny fly in the ointment!

The "magic" simplicity and "titanic" results given by the first three wonderful items has swept a wave of construction over the youngest members of the family, the "Safe-power" units, and brought in its train numbers of constructors who seem to regard radio set assembly as nothing much more than grown-up toy-brick building.

Now you can take liberties with "Magic" sets and Brookmans Rejectors and not do much more harm than get very poor results. That is harm enough in all conscience, but it does not amount to much in comparison with what can happen if a mains unit is haphazardly strung up and carelessly used.

**Plain Words.**

The "Safe-powers" are safe enough when they are built and used in accordance with the directions accompanying the constructional articles. Depart from those and you are heading for trouble. I am speaking, or rather writing, plainly because plain words are very necessary, judging by some of the so-called "P.W." "Safe-powers" that I have happened to come across—"Safe-powers" built by "P.W." readers.

I have seen them made up in wooden boxes instead of in metal cases and without the special safety plug arrangements. Actually, of course, such travesties are no more "P.W." "Safe-powers" than are mouse-traps!

It must be remembered that once you leave ordinary set assembly and start to tackle mains units you enter the realm of electrical power engineering.

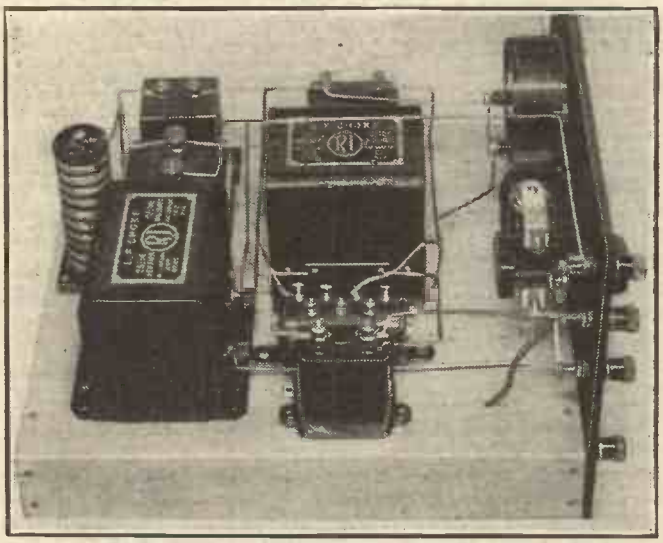
You are quite safe so long as you "keep to the book." Wander away from your guide and you may fall over the precipice. Familiarity breeds contempt and the electrical equipment of the average house is so completely domestic, often so entirely docile that one is apt to grow into regarding the "juice" as a quite innocuous, benevolent and tractable fluid.

**Trouble That Is Avoidable.**

I don't want to be alarmist, but I must point out that this is a very wrong attitude indeed. Now and then we hear of deaths occurring through the use of faulty domestic electrical apparatus. But for every one of these about which you happen to read there may be dozens that do not get nationally chronicled.

And I would hesitate to guess at the number of fires and serious shocks and burns that are due every day to similar causes. Mind you, it is my opinion that the vast majority, if not all of these would be quite avoidable if people would always bear in mind the potency of electrical power when they use it for any purpose at all.

## DESIGNED ON SOUND LINES.



This is a photo of the "Safe-power" Senior model with its metal case removed. All the "Safe-powers" are designed on "safety-first" principles; and enable constructors to use their mains effectively and without risks of any kind.

Domestic electrical apparatus could be made much safer—very much safer. When I see power point sockets with their live metallic parts naked to the air, and electric irons with "'phone cord" connectors, and electric fires with unprotected or practically unprotected elements, vacuum cleaners with "ten-milliamp." switches and wiring, and so on, I wonder what the Board of Trade does with its enormous staff! And I marvel at the apparent immunity of many households from electrical incidents and accidents.

However, there is one measure of protection and that is that you break all sorts of Board of Trade and local bylaws, and incur no end of penalties if you tamper in any way with the mains wiring. I hope that is widely known. You mustn't even remove a light fitting or change a switch unless you are a qualified electrician.

But there don't seem to be many restrictions on the external use of the power. That is to say, it seems that you can connect any tuppenny-ha'-penny electrical gadget to one of the power or light points. Here the wise man uses a very big slice of discretion.

**Flimsily-Built Devices.**

Personally, I cannot see that it is any more dangerous to cut into the actual power wiring than to stick on some of those flimsily-built devices you see selling at bargain prices.

The radio amateur should always remember that whatever is joined to a light or power point becomes, in effect, an extension of the electrical power system.

When a mains unit is coupled to a radio receiver the whole radio set must be regarded as part and parcel of the borough council power scheme.

In some cases the high tension is confined to those points of the set that are at high tension when the ubiquitous dry H.T. battery is used. There are other circumstances when practically the whole set is lifted to a high and maybe dangerous potential.

This is likely to occur where there is a three-wire system D.C. supply. If your house happens to be served with what is known as a "neutral" and a "negative" lead, even your radio aerial is likely to be given a dose of H.T. when a mains unit is in use.

If you are not sure about the kind of distribution peculiar to your district it is just as well to act as though this is the case.

(*Continued on page* 304.)

LATEST BROADCASTING NEWS.

# TELEVISION DEVELOPMENT

## MR. ECKERSLEY AND MR. GRAVES—SIR OLIVER LODGE LOOKS BACKWARDS—LONDON REGIONAL VAUDEVILLE—DERBY ARRANGEMENTS—ETC.

THERE are several fresh signs of renewed activity in the television world. Since the reorganisation of the Baird Companies under Mr. Napier, which took place last month, more attention has been paid to the practical problems of reception. The B.B.C., too, seems to be taking television a good deal more seriously than it did.

### Mr. Eckersley and Mr. Graves.

The denial of the story that there has been any change in the organisation of the Programme Branch of the B.B.C. has been the cause of a good deal of amusement at Savoy Hill, where the changes referred to were formally notified to all members of the staff some time ago.

### Sir Oliver Lodge Looks Backward.

The seventeenth and last talk of the interesting series entitled "Looking Backward," will be given by Sir Oliver Lodge next week.

### London Regional Vaudeville.

Kathleen O'Regan, who took the part of the schoolmaster's wife in the broadcast version of "Young Woodley," and also that of the heroine in "The Four Feathers," a few weeks ago, is to act as announcer in a vaudeville programme for London Regional listeners on Friday, May 30th.

The programme will include a sketch, "Six Little Ballet Girls," by Harold Simpson and Stanley Holt, which incidentally would have been heard before but for a serious motor accident to Mr. Holt, and also items by Dorothy Dickson, Ronald Frankau and Mr. Flotsam and Mr. Jetsam.

### Derby Arrangements.

They say that the "Tote" has brought increased interest in horseracing, by which we may perhaps infer that the crowd which swarms to Epsom Downs for the Derby on Wednesday, June 4th, will be the largest ever.

But for every person who is likely to see the great race there will be fifty whose interest in it, and particularly in the winning horse, will be just as keenly anticipated.

The B.B.C. is, of course, broadcasting a running commentary on the race as usual, the commentators again being Mr. R. C. Lyle, the well-known sporting journalist, and Mr. Alan Howland.

Previous to the race itself there will be a short introductory talk and descriptions of the runners, the draw and the parade.

### Sporting Broadcasts on June 20th.

Friday, June 20th, will be a great day for sporting broadcasts from the National transmitters. The final games in the open Golf Championship are to be played that day, and an eye-witness' account of the proceedings will be given at 1 p.m. and again at 6 p.m.

These accounts will be relayed direct from Hoylake. On the same day a running commentary on the senior T.T. Races will be relayed from the Isle of Man.

### British French Week in West.

Several special programmes in connection with British French Week, which is to take place at Bristol between May 31st and June 7th, are to be included in the West Regional programmes.

The Week has been arranged to promote a closer friendship between Great Britain and France with a view to the expansion of trade, industry, and commerce between the two countries through the ports of Rouen and Bristol, and the event will attract many important people from the other side of the Channel.

The arrangements include an exhibition of modern French art in connection with which several afternoon programmes by the Lockier String Orchestra will be heard by listeners; an Entente Concert relayed from the Colston Hall on Sunday, June 1st, at which the Rouen Municipal Band and several French artistes will appear; several concerts of band music relayed from the Zoological Gardens, Clifton; an Anglo-French programme in the Cardiff Studio on Thursday evening, June 5th, in which the National Orchestra of Wales will take part: and a production entitled "Daphne in Paris," presented by the Bristol Drama Club on Tuesday, June 3rd. In addition there will be several appropriate talks.

### Sir Granville Bantock's Anniversary.

Sir Granville Bantock has completed nearly thirty years as principal of the Birmingham and Midland School of Music, and the occasion is to be celebrated on Tuesday, June 3rd, with a special concert at the Birmingham Town Hall.

The Midlands are very proud of Sir Granville and the fame he has brought to his School of Music by successful artistes and composers, among them Frank Mullins, Julius Harrison, Rosina Buckman, Arthur Cranmer and Walter Hyde, who have graduated from it.

It is, therefore, only fitting that listeners should hear this concert which, while being the annual students' concert, is so much more important on this occasion. The principal work to be performed will be Delius' "Appalachia" for Chorus and Orchestra.

### Relays from Summer Resorts.

The summer season of relays from health resorts in the North begins after the Whitsun holidays, when regular afternoon and evening concerts are to be broadcast throughout the Region. This year concerts will be heard from Morecambe, Buxton, Blackpool, Harrogate, Scarborough, Bridlington and Whitby.

## MAKE YOUR TUNING SHARPER.

One of the best ways of sharpening tuning is to use a separate aerial coil. If your set hasn't one, you can easily roll 20 turns or so of coil wire into a hank, as shown, tying it with string (not wire) to form an aerial coil. The method of using is shown in "Captain Eckersley's Query Corner" on another page.

# FOR THE LISTENER.

**A Specially Contributed Criticism of Current Broadcasting Events. By "PHILEMON."**

**Who will long be remembered for those wise and witty broadcasts entitled "From My Window."**

### Eaves-Dropping.

WHILE waiting for the Budapesth Choir to begin the other night, I overheard the following conversation in undertones through the loud speaker: "Did you really?" "She was in blue." "Was Jack with her?" "Not Jack!" "Are you sure?" And, being a nosey-parker of the deepest dye, I wondered, even while the Budapesth Choir was singing entrancing music, who was the Lady in Blue, and who was it with her who ought to have been Jack! Scandalous!

### "The Bat."

How Covent Garden enjoyed itself! How the jewels glittered on the shaking chests! I do not know enough German to be able to follow dialogue from the stage, and I think that the B.B.C. might have devised some way of helping me in this; but the music of "Die Fledermaus" was altogether delightful—a joy for ever.

Covent Garden was "low-brow" for once in a way, and sounded almost human! Of course I love "The Ring"—the "Rhinegold" is a bright flashing name, and "Gotterdämmerung" is one of the best swear words I know!—but after the success of Johann Strauss' gay music I hope Covent Garden will give us every season "The Ring" and "The Bat!"

### Jazz.

Lord! what salty things Mr. Edward Newman said about it! "Jazz is dead," he said. "It was never an Art," he said, "but simply a Business." And he said, "It began among the musical illiterates, and

(Continued on page 304.)

# A "FAN" ABROAD

## ① IN BERLIN WITH A "FERNEMPFÄNGER"

**The first of a special series of articles describing the radio adventures, in various countries, of our special correspondent.**

HERE'S a tip. If you intend taking a portable set with you on a trip into Germany, then make sure that the set won't go wrong. May the kind fates help you if something "gangs agley" and you have to ask for spare parts at a radio shop!

These long words look bad enough in print, but when you come to mouthing the German equivalents of such harmless words as "dry H.T. battery," "fixed condenser," or even "grid-bias battery," you'll want to take a breath in the middle.

### Stations Everywhere!

I won't give the equivalents of these here—not because I don't know them (I found them out after patient investigation), but because if I did there'd be no room for this article.

But what of Berlin itself, where I recently spent a short while in the company of a four-valve portable? One would never think, looking at Berlin, that Germany lost the war. Berlin looks much richer and cleaner than Paris.

It never shuts, night or day. It is a great deal gayer than the so-called gay French capital: and wireless forms a big part of the jollity; at least, so far as the average German citizen is concerned.

On the average set, and on my portable, there are stations, stations, everywhere; all over the dials. There is a much greater choice of programmes than in England, and reception is easier because of the high power which the giant stations such as Langenburg and Zeesen are using.

Where Germany lost at Versailles, she won at the Prague radio conference! Of her twenty-nine main stations, twenty-four have exclusive wave-lengths. Only Norddeich and the much smaller Augsburg and Freiburg have not been allotted wave-lengths under the Prague Plan. Only three small stations, Stettin, Magdeburg, and Berlin (the 0·5-kw. station) have common wave-lengths. So, you see, Germany has a very fair slice of the ether to herself; and she has certainly well filled it with stations. Moreover, the country is surrounded by other nations who are also putting up bigger and bigger transmitters. The middle of Europe is now the hot-bed, as it were, of radio giants, and the average German listener benefits.

Of course, the increase of the Berlin transmitter to 12 kilowatts will make a difference to local reception, and there may be a mild form of the wipe-out London listeners have had from Brookmans Park; but, in the meantime, reception is really the goods.

I needed the directional properties of the portable's frame to separate some of the bigger fellows; but I had twice the number of full loud-speaker stations in one evening in Berlin than I can get at home, eight miles from London.

Thanks to a coincidence, there was staying in the same hotel as myself a German radio enthusiast who had a portable—a commercial job known as the Seibt—and this was the only portable I saw during the whole trip.

The Seibt was a nice-looking little job, and its owner was keen to compare notes with me. The set had one screened-grid stage, with separate aerial and H.F. controls, a frame aerial in the lid of an attaché case, wound round the loud speaker, dry H.T., non-spill accumulator and so on; but my modified P.W. "Regional" Four easily beat it on performance.

### Communal Radio Popular.

The Seibt's screened-grid stage did not seem very effective. A thing I liked about it—and it is a feature to be found in many ordinary household sets in Germany—was the fact that the actual receiver was built up on a metal chassis which could be drawn out of the suit case for inspection, leaving the batteries, frame and loud speaker behind. The metal chassis idea, popular in America, is being copied more closely in Germany than in England.

POTSDAMER PLATZ.

In the heart of Berlin on a bright and busy spring morning.

A business man with whom I came in touch invited me home to his flat on the outskirts of Berlin, for an evening's radio entertainment. He had no set, but only a moving-coil speaker connected to the flat's communal radio system.

This is a very common idea, although we in England think it curious. My friend paid for his radio in with the rent for the flat, the telephone, and so on; virtually it cost him nothing, but he had gone to the trouble of buying an accumulator to energise the moving-coil speaker windings.

Cone speakers are generally used, but we have much better instruments in England. German listeners do not appear to favour too much bass, and most of the cone speakers I heard sounded high-pitched.

I was told that some of the flat communal radio systems used a kind of wired-wireless system on the electric light wiring, and that the Telefunken people were responsible.

The Telefunken concern, by the way, holds most of the chief patents in Germany, and only about twenty-five firms are allowed to make sets. The trade is, therefore in a rather peculiar position, and the result seems to be good. At least, the general standard of quality is high; the complete sets are quite efficient, American-looking outfits.

### Programmes Very Poor.

The strange thing is that one sees very little of the junk which is on our radio market, and which is generally supposed to be "Made in Germany." Gadgets and little fittings which I saw in the Berlin shops were all very sound, and good value for money.

The strange thing in receiving was that, for the first time, I really did feel away from home. The B.B.C. stations seemed so distant, and the guttural locals roared in at about every five degrees on the dial.

Old friend 5 X X was often not good enough for loud-speaker working. Radio Paris was always loud. The medium-band British stations were *there*, but they had not the strength that the German mediums seem to have to us in England.

I should like to pay a tribute to the quality of German broadcasting. Once upon a time they used to over-modulate to cater for the crystal user; but there are precious few crystal users now, and the transmission quality is every bit as good as the B.B.C. at its best.

But the programmes were poor. They have either hours of talk (some very high-brow talk, too), or hours of opera or hours of light music. There is too little variety.

## CORRESPONDENCE.

# YOUR LOUDSPEAKER.

**"WHAT DO YOU THINK ABOUT THIS?"—THE "TINY" TWO—THE "MAGIC" TWO—A NEW BOOK ON TELEVISION.**

**Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed: but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.**

### YOUR LOUDSPEAKER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just read with great interest the article on "Your Loudspeaker" by Victor King.

For some years now I have advised disgruntled listeners to specialise on solo items, quartets and sextets, and to leave alone the large volumes of sound that the B.B.C. try to inflict on us.

The only successful reproductions of symphony music and big bands are from the gramophone record via a mains amplifier, plus a large moving-coil speaker, minus a cabinet.

The big disadvantage to the one-act play (or any play, for that matter) is that the majority of the words are spoken too quickly and the point is missed by the listener. The jokes of one of our most successful broadcast comedians failed to "get over" for that very reason.

As Mr. King implies, a slight resonance from the loudspeaker can be very pleasing to the average ear, and can transform a nasty "noise" into a very pleasing "sound."

Finally, I am convinced that radio would be enormously increased in popularity by the inclusion of more solo items in the programmes.

Yours faithfully,
T. G. STODDART.

Yorks.

### "WHAT DO YOU THINK ABOUT THIS?"

The Editor, POPULAR WIRELESS.

Dear Sir,—My "receiver" developed this (rattling) fault, but only on the octaves of piano near centre of keyboard. See "P.W." April 12th, page 120.

The misbehaviour of the instrument puzzled me for weeks, and after "testing" for loose wires, damaged components, etc., etc., or run-down batteries, I gave it up. I wrote the B.B.C. in the hope of getting a clue. Their suggestion was "too much reaction," or try "fixed condenser in aerial lead." Neither of these points affected the vibration.

As I only use det. and one L.F. for the three powerful medium-wave British stations, I suspected trouble in the det. circuit and therefore concentrated on that portion. Nothing could be found to cause the trouble here.

One night the G.B. plug got knocked out and, when replacing, a lower voltage socket was selected, and the "vibration" was very much reduced. I waited for piano music and then adjusted the G.B. on reception of same, and now found that all the trouble had vanished. (Of course, I switched off while making adjusting movements of G.B. plugs.)

On Sunday last I wrote the B.B.C. giving the information in case a similar enquiry should be received by them, from other listeners suffering from what has been termed "piano blasting" by myself and others.

I am wondering whether the answer to the above query will confirm that trouble was "G.B. voltage too high"? It is worth noting that no distortion was noticeable and no vibration experienced on any other musical instrument or on speech received—only on pianoforte.

My constructional experience is purely amateur and has been gained only with the help of your valuable paper, "P. W." Good luck and long life!

Yours faithfully,
W. J. (BEDFORD).

TECHNICAL EDITOR'S NOTE.—This is a good instance of how different faults provide virtually identical symptoms. In both cases there was a rattle on certain piano notes, but the other reader of "P. W." found that in his case the trouble was a loose nut on the loudspeaker's cone.

### THE "TINY" TWO.

The Editor, POPULAR WIRELESS.

Dear Editor,—I am writing to thank you for such a perfect little portable, that is, The "Tiny" Two, described in "P.W." No. 410, April 12th, 1930. I took the set to some allotments near my home and connected up a small wire fence, roughly 15-20 ft. long and 2 ft. from the ground, for aerial, and using no earth.

Results were astounding! I received National on 1554 metres, Midland Regional, London Regional, and National on 261 metres at very good 'phone strength, enough to work a Lissen Cone speaker in a quiet spot. Cardiff and Bournemouth and several foreign stations came in at ordinary 'phone strength.

I have built it in the small cabinet described for the "Holiday" Two, "P.W." No. 356, March 30th, 1929, this having room for two pairs of 'phones. Thanking you again. I remain,

Yours faithfully,
J. T. MANNING.

P.S.—I have also had good results from "P.W.'s" "Everybody's" Three and "Screened Grid Short-Wave" Three.

Wilts.

### THE "MAGIC" TWO.

The Editor, POPULAR WIRELESS.

Sir,—I have built this set, and am in entire agreement with the letters you have already published concerning its DX capabilities on broadcast wavebands. The Lissen pentode adds a punch to the signals which, in my humble opinion, more than pays for the slightly higher price of this valve.

With the usual good wishes,

I am, sir,
Yours very truly,
"ETHERCOMBER."

Gloucester.

### A NEW BOOK ON TELEVISION.

The Editor, POPULAR WIRELESS.

Sir,—I was interested to notice that you had given the job of reviewing "Television, To-day and To-morrow" to my old hated rival, R. W. H. I must say that in the circumstances he has done the job well—that is, within his limitations.

Seriously, it is a fairly fair review.

Now, there are two points upon which I must comment. He says:

"It is a pity, perhaps, that more space is not devoted to other systems," and justifies his contention by adding:

"The meagre amount of space given to other systems is all the more surprising since in his introduction Mr. Moseley complains that American books on Television have furnished a wrong impression of the subject by saying too little about Mr. Baird."

If R. W. H. had read the introduction from which he quotes a little more carefully, he would have seen that it was because other works that come from the American side have paid altogether insufficient tribute to Mr. Baird that I stated as plainly as possible:

"It is only correct, therefore, that we should balance matters by telling the story of Baird Television. . . ."

In other words, the book I have written for the British public is openly intended as a full tribute to a British inventor.

The second matter is of more importance to myself personally. R. W. H. raises the point of my association with the Baird Company. I should like to state that I am Chairman of Television Press, Ltd. and Director of Programmes and Liaison with the B.B.C. for the Baird Company; but above all I am a friend and an out-and-out champion of Mr. Baird. POPULAR WIRELESS, in an editorial note some time ago, used the right word in this connection. That word was "chivalrous." I entered into this fight in that spirit. The fight, so far as I am concerned, is won, for we are on the ether. So far as the commercial side is concerned, I am not so interested, but I gather that matters in this direction are proceeding very satisfactorily.

Yours sincerely,
SYDNEY A. MOSELEY.

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# SHORT-WAVE NOTES.

**By W. L. S.**

QUITE a long time ago I remember mentioning, in connection with the well-known "W. A. C." certificate that graces the room of the transmitter fortunate enough to have worked all continents, that there should be a similar institution for the British Empire.

I have known for some time that plans were going ahead for something of the kind, but I was very pleased to see just recently one of the new "W.B.E." certificates that are now in full swing.

These are issued to R.S.G.B. or B.E.R.U. members who have been in two-way communication with a British possession in each of the five continents, and certainly make a handsome addition to one's "den." The British Empire Radio Union, incidentally, is growing apace, and has quite an imposing membership roll.

### Creating Friendships.

Probably there has never been anything quite like amateur transmission for the creating of friendships between a body of workers all enthusiastic over the same subject.

Whether the man "at the other end" is away in a far corner of the Empire or three streets away, one wants to meet him after having exchanged greetings with him over the ether, and very often pleasant little gatherings of transmitters are arranged from time to time, at which all are old friends, though none have ever before met in the flesh!

Also, as a friend remarked very cynically, the feeling of brotherhood amongst "hams" is so strong that one never visits the domain of another without going away with his pockets and hands full of borrowed "junk." In some cases it is never returned, but as the "give" and "take" are generally about equal, it does not matter much!

Continuing my remarks on the 150-metre amateur band, I am very pleased to note that still more are making use of it for Sunday work, when all the shorter waves are hopelessly crowded out.

I have been doing some interesting work on this wave myself for a few Sundays now, and it is such a complete change from the real "DX" work on the shorter waves that I quite look forward to it as a weekly treat.

Readers of "P.W." seem to take quite an interest in low-power transmission work on the short waves, judging by the letters I receive, but most of them make the fatal mistake of being in far too much of a hurry to apply for a full licence, put a transmitter on the air, and make a noise!

It is far better to go about it slowly and to find out more about it before attempting to start. Various articles on the subject have appeared from time to time in "P.W." and its sister journals, and such publications as the A.R.R.L. Handbook, to which I have often referred before, give fuller and more technical information.

I notice that atmospherics have been rather strong during the last week or so, even on 20 metres, where they are usually completely absent. I have never, in any circumstances or any weather, heard atmospherics on 10 metres or below.

### "Man-made" Static.

The theory that they take the form of transmissions on a very long wave-length seems to have quite a lot of evidence in its favour, although "man-made static," as our American friends call it, becomes more severe on the shorter waves. It is conspicuous by its absence, for instance, on 150 metres.

It seems to me that low-powered short-wave transmitters have quite a big future in front of them for relay work in connection with public address systems that have to cover a wide area, as in the case of the R.A.F. pageant.

A friend tells me that they have been substituted for land-telephones very successfully on several occasions abroad, even where the lines would not have been more than four or five miles long, with a great increase in convenience and, of course, portability.

# Short-Waves on Ordinary Sets

**You can explore the world for short-wave programmes on practically any set providing you make the slight modifications that are described in this practical article.**

**By G. T. KELSEY.**

THERE was a time, and that not so very long ago, when short-wave reception was regarded as a quite isolated branch of radio reception, an impression created no doubt by the type of receiver then deemed to be necessary for the satisfactory reception of signals below about 50 metres.

Those were the days of "supers," "ultras," and "low-lossers," when, in order to join the "ham" throng one had to construct a skeleton-looking arrangement with something akin to a broom handle on the condenser in order to keep the hands away from the tuning control!

But those days—possibly rather humorous in the light of modern ideas—are over.

### Using an Ordinary Set.

Now almost any set of the straightforward type can be used equally successfully for the 'phone reception of "Pittsburg, Pa." as for the L.S. reception of Brookmans Park—conditions permitting, and with certain reservations.

Which brings us, possibly with something of a bump, to the purpose of the present article. It is about these reservations—perhaps a better word would be alterations—that I intend to discourse, and if your set can be placed into a common category as possessing the following features, then there is no reason why you, too, should not be listening to-night to "Pittsburg, Pa.", or, for that matter, to any of the other distant short-wavers.

(*a*) The first valve must be the detector. It matters not whether it is followed by one or more L.F. stages so long as it is not *preceded* by H.F. stages.

(*b*) The set must employ plug-in coils. Preferably, but not absolutely essentially, with reaction on the Reinartz or other capacitative control system.

(*c*) A slow-motion dial or other means whereby the tuning condenser can be rotated very slowly is indispensable.

### Coupling the Aerial.

I daresay there are hundreds of sets which fall into this usual grading, and the following hints should therefore be of fairly general interest.

The first little point where, so to speak, we come up against it, when attempting to use a broadcast set on short-waves, is in the matter of aerial coupling, although fortunately it is a difficulty which is readily overcome by the use of a small home-made condenser, such as is shown in the diagram.

Commence then by fixing a new terminal, which we will refer to as A2, to the terminal strip, and join the shank of this terminal to one side of the condenser mentioned above, which can be fixed at any convenient point on the baseboard. To the other side of this condenser attach a short length of flex fitted at the remote end with some form of clip.

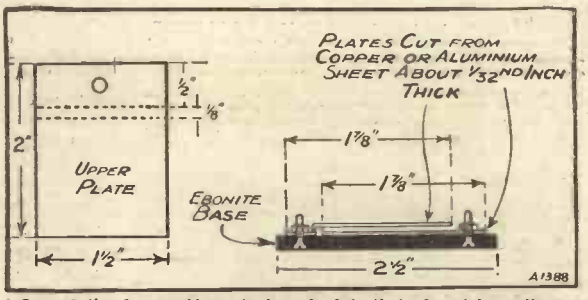
So far, so good, and now we can pass on to the question of coils. Place a four-turn plug-in short-wave coil in the holder which normally takes the grid coil (the one which is connected to one side of the grid condenser), and a three- or four-turn plug-in coil of the same type in the reaction coil socket.

If on the ordinary broadcast band your set uses a separate coil for aerial coupling, the socket with the coil removed can now be ignored, thereby doing away with the necessity for three plug-in coils.

The clip connected to one side of the new fixed condenser has to be clipped to one of the turns on the short-wave grid coil. The best point to start at is the middle turn.

If your tuning condenser has a maximum capacity of ·00025, ·0003, or ·00035, it will be perfectly satisfactory as it stands. If, however, as is very probable, it should be one of ·0005, it would be advisable to make a slight modification in this direction. Actually, the condenser could be used as it is, but to make tuning a little less critical on short-waves it is advisable to join a ·0005 fixed condenser in series.

### THE COUPLING CONDENSER.




**One of the few problems to be solved is that of aerial coupling. But this can be arranged efficiently by using a small condenser that you can make at home with little trouble. The details are given in the above diagram.**

To do this, remove the connection or connections at present going to the grid side of the tuning condenser, and join it, or them to one side of the fixed condenser. The remaining side of the fixed condenser should then be connected to the vacant terminal on the variable condenser.

The set is now quite ready for use, and it can be switched on and operated in exactly the same manner as previously, only this time it should be remembered that tuning will be exceedingly sharp, and very careful manipulation of the controls will therefore be necessary.

### Obtaining Reaction Effects.

If you experience any difficulty in obtaining reaction, try first using the tap on the grid coil at a position nearer to the earth end of the winding, and if this should not do the trick, the distance separating the plates of the series aerial condenser should be increased. For best results, however, these plates should be used as close to one another as possible, providing the set can still be made to oscillate satisfactorily.

By the way, if you find it consistently impossible to obtain reaction, it may be due to the H.F. choke not being suitable for short-wave work. In this connection it is only fair to mention that this fact does not necessarily cast reflections upon the choke in use.

A choke which may function perfectly on the broadcast waves may not be suitable for short-wave work, and if you come up against this difficulty wind 80 turns of No. 30 D.C.C. or D.S.C. wire single-layer fashion upon a former of roughly 1 in. in diameter, and use it in place of the normal H.F. choke for short-wave work.

### Broadcast Waves Again.

When you tire of short-wave station hunting, all that you will have to do will be to change the aerial lead-in from the new to the old terminal, replace the normal coils, short-circuit the series condenser (if used), and, if necessary, alter the H.F. choke arrangements. You will then be able to listen as before to your local station on normal waves.

As a concluding remark, may I just emphasise the absolute necessity for smooth reaction control on short-waves. In this direction, if reaction is inclined to be ploppy, experiment with the H.T. voltage on the detector valve until perfectly smooth working is obtained.

# NOTES FROM THE NORTH.

**All the latest news about programmes, special items, and broadcasting in general in this important area is given**

**By OUR NORTHERN CORRESPONDENT.**

I HOPE I shall not be accused of prejudice if I say that of all the B.B.C. Regions the Northern Region is putting up the best individual show in its programmes, and, on present form, seems to be the most likely to make a red-hot success of its regional broadcasting when the high-power station comes into service. I do not make this statement without having studied progress and programmes in other regions.

Until the North Regional high-power station is ready, northern stations are broadcasting a mixture of parts of the National programme and items of Northern origin. Since the beginning of May the proportion of the latter has been increased. This, as the North Regional Director (Mr. E. G. D. Liveing) has just stated in a broadcast talk, "represents an active preparation for what is to come."

### Special Programmes.

Although its opportunities for broadcasting its own programmes are so severely restricted, the Northern Region has arranged a series of programmes for the summer months which, for enterprise and first-rate local interest, will take some beating by any other region. As disclosed in Mr. Liveing's talk, they include:

The new Promenade Concerts, to be held nightly for a fortnight in Manchester, a week in Liverpool, and a week in Leeds, with the Halle Orchestra, under Sir Hamilton Harty.

Regular relays from the holiday resorts—Harrogate, Scarborough, Buxton, Morecambe and Blackpool—starting at Whitsuntide and ending in September; and relays also from Whitby and Bridlington.

A running commentary on the Senior T.T. motor-cycle race in the Isle of Man.

A Manx Week.

### Running Commentaries.

Running commentaries (*not* eye-witness accounts) on the Lancashire v. Yorkshire cricket matches at Leeds and Manchester.

A description of the race for the Northumberland Plate (the "Miners' Derby"), relayed through Newcastle.

Services from York, Newcastle, and Bangor Cathedrals.

Broadcasts in connection with such events as the Royal Show at Manchester and the launching on the Mersey of the Britannic, the largest motor-ship constructed in Great Britain.

Extended concerts from the Manchester, Leeds, and Newcastle studios.

The North Regional high-power station will come into operation towards the end of the year. Like the Daventry and Brookmans Park stations, it will broadcast the National programme and a Regional programme, *but* I am assured that most of the North Regional programme will originate in the North of England. It will be more definitely a *Regional* programme than are either the Midland Regional or the London Regional programmes.

### Local Colour.

The ideal conception of regional broadcasting is not only to provide alternative programmes but to interpret in the regional programme the local interests and life of the region as contrasted with the national interests attended to by the National programme.

The Midland and London Regional programmes have fallen short of this ideal. Although they are now full-time programmes, neither of them has as much "local colour" as the Northern Region is already putting into its occasional regional programmes. And Mr. Liveing's staff is only "preparing for what is to come"!

On present form the North Regional programme to be broadcast from the Northern high-power station will knock the Midland and London regional programmes into a cocked hat. "I shall be surprised if, after six months' work, we shall have to admit that we cannot provide the majority of the material on the regional wave-length," states Mr. Liveing.

### An Orchestra's Fate.

The North is "a nation within a nation" (to quote the North Regional Director). It has a strongly marked character of its own. This is an advantage for Mr. Liveing's staff, and, by comparison, those who arrange the Midland and London regional programmes are under a disadvantage in having to provide programmes for regions with less vigorous local characteristics.

In his survey of the future Mr. Liveing avoided one important topic—the fate of the Northern Wireless Orchestra.

When the B.B.C. announced its decision to disband the Birmingham orchestra, it stated that "one of the results of rapidly improving technical conditions in broadcasting is the gradual rearrangement of orchestral work, involving reductions in the existing studio orchestras in provincial centres."

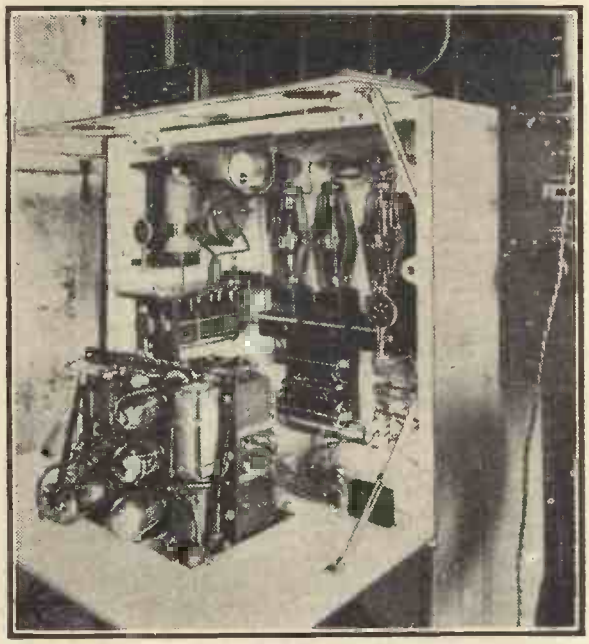
### Under Consideration.

The future of the Northern orchestra is, of course, under consideration, and it seems probable that it will go the same way as the Glasgow and Birmingham orchestras. Nevertheless, no decision has yet been promulgated, and there is yet time for the B.B.C. to come to a different conclusion in the North of England.

There is no doubt that the brilliant work of the Northern Wireless Orchestra has done a great deal to put Northern broadcasting in its present excellent position.

The inauguration of the high-power station will not be without its troubles!

## RADIO FOR LUNDY.



By means of a special radio installation, regular communication with Lundy Island is now possible. Here is a photograph of the transmitting and receiving equipment on the mainland.

# GRID BIAS *and* YOUR PICK-UP

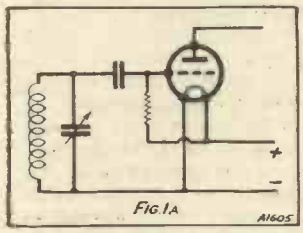
**A straightforward talk about the use of gramophone pick-ups in ordinary radio receivers.**

**By K. D. ROGERS.**

THE problem of connecting a pick-up to an ordinary set is one which besets every owner of a radio receiver when he decides to have a shot at the electrical reproduction of gramophone records. The questions as to where to place the pick-up and what type of pick-up is best have both to be answered.

Taking the latter first, it depends wholly upon your speaker and amplifier—if you have a speaker and amplifier system that gives rather a preponderance of bass, you need a pick-up that will emphasise the treble, while if the speaker is giving you more treble than bass then a pick-up with a characteristic which tends to emphasise the bass will probably give better all-round reproduction.

## THE DETECTOR.

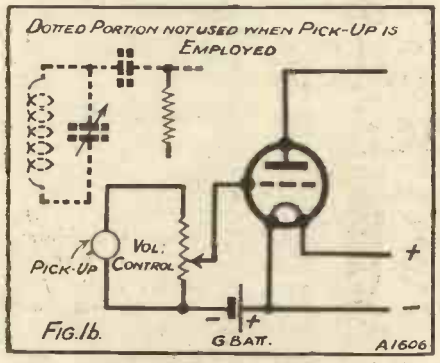



This figure shows an ordinary detector stage.

But the choice of a pick-up is only half the problem. The other half is that of the placing of the pick-up in the set. This is not a difficult task, but it is one which requires a little thought.

For instance, it will depend upon the sensitivity of the pick-up, the power of the amplifier, and the sensitivity of the speaker, whether the pick-up is so placed that two or three or even more stages of L.F. amplification are available.

## THE PICK-UP CIRCUIT.




Here we see a pick-up used in the above circuit. Note the provision of bias.

If your set is a detector and one L.F. then you need a sensitive pick-up and must place it in the detector circuit. But if the set is a three-valver (Det. and 2 L.F.), then you must decide whether two valves will be sufficient or whether it will be better to use the three when the pick-up is employed.

As a general rule it is far better to use the three, that is, to place the pick-up in the grid circuit of the detector valve, with a volume control so that the volume can be varied to suit the requirements of the moment.

**Bias is Essential.**

But it must not be forgotten that wherever the pick-up is placed the stage requires grid bias in order that the best results shall be obtained. Thus, if we have a circuit such as Fig. 1A, and add a pick-up (1B,) we have to supply bias so that the valve shall operate properly.

In Fig. 1A the valve is acting as an ordinary detector valve, using the leaky condenser principle, but in Fig. 1B it is being employed as an L.F. amplifier and must now operate on a different portion of its characteristic curve.

When a pick-up is used in an ordinary L.F. stage this question of negative bias does not arise, as the valve is already biased and the bias is unaffected by the switching in of the pick-up.

In Fig. 1A and 1B, however, we have to arrange things so that the valve is operating under the proper conditions.

If you study the curve shown in Fig. 2, you will see that we have a grid base of about 2½ volts to the left of the vertical line, between that line and the point where the characteristic curve flattens out at the point X.

**Overloading and Rectification.**

This base is available when the valve is operating under L.F. conditions (as an L.F. amplifier), and we choose a voltage so as to give us a definite negative bias at about mid-way between "X" and the vertical line, or zero grid volts.

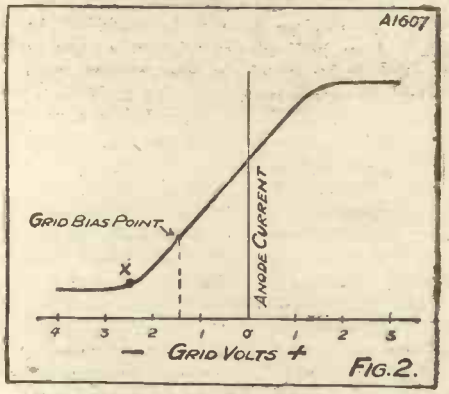
Thus, we set it at about 1½-volts negative, and we run our pick-up, which gives L.F. voltage fluctuations on either side of that point.

The volume control is used to limit the fluctuations so that they do not throw the grid voltage either to the left of the point "X" or to the right of the vertical line.

In actual practice we keep the limits well within these points, and then we are sure of pure reproduction. If these points are passed we get partial rectification and consequent distortion.

Now look at the curve again, and assume we have no applied negative bias voltage—the voltage is on the zero line or to the right of it, and we get grid current flowing (for the grid is getting positive), and this causes rectification to occur—a thing we do not want to happen when a pick-up is being used. Instead of the plate current varying exactly as the applied grid voltage is varying, we have it varying unequally, the positive impulses having more effect than the negative.

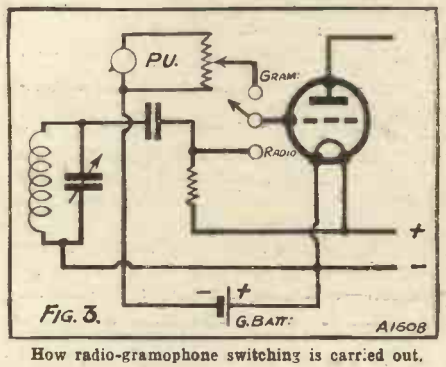
## HOW BIAS WORKS.




Determining the correct bias point.

So you see that bias is an important feature of pick-up reproduction and must be specially arranged for if the detector valve is to be used as an L.F. amplifier when the pick-up is in use. Fig. 3 gives the circuit of a detector stage with radio-gram switching, the bias being applied as required, when the valve is acting as an L.F. amplifier.

## RADIO OR GRAMOPHONE?




How radio-gramophone switching is carried out.

It is sometimes said that the pick-up can go to L.T.—, but this is not satisfactory, as we have seen. Bias must be used for good results.

# FROM THE TECHNICAL EDITOR'S NOTE BOOK.

## Tested and Found—?

You just touch the blotter with a spot of acid from your accumulator, and the colour the blot assumes indicates the state of your battery. It certainly does its job well and only costs 2d. That is a strikingly low figure for a battery tester, isn't it?

### THE "LEWCODENSER."

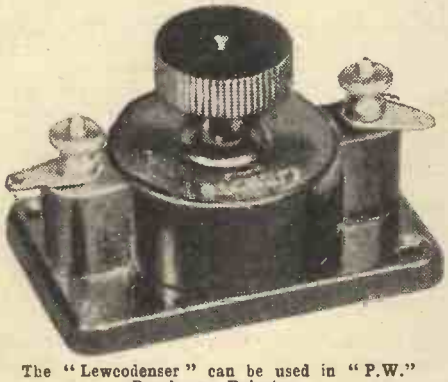
"P.W." readers cannot have failed to have noticed the widely increasing popularity of the compression-type of variable condenser.

In principle it is far from being a new thing, but its uses have become widespread only in recent times.

Of course, the "P.W." Brookmans Rejector gave it a tremendous fillip, and we are inclined to think that to this device is due the inception of several quite well-known makes of compression condenser.

And constructors must have been gratified to learn that the "Lewcos" people had entered the field with the "Lewcodenser."

This "Lewcos" version is a fine job throughout, and we have no hesitation at



The "Lewcodenser" can be used in "P.W." Brookmans Rejectors.

all in recommending its use in "P.W." Rejectors and sets when compression condensers are specified.

The type O "Lewcodenser" has a maximum capacity of ·001 mfds. and the type W ·002 mfd., and each is now freely available everywhere at 2s. 6d.

It is a first-class little component, as nicely designed and finished as any of the more complicated and expensive "Lewcos" products—and that is saying something.

### THE SINGAL-DROP BATTERY BLOTTER.

Quite one of the most original ideas I have come across for some time is the Singal-Drop Battery Blotter, which has been evolved by that enterprising Mr. A. E. Bawtree, of 20, Manor Park Road, Clapham, Surrey.

In appearance it resembles very much an ordinary blotter, yet it must be the only device in the world by means of which the specific gravity of accumulator acid can be ascertained from a single drop.

### NEW EVER-READY BATTERY.

The Ever-Ready Co. has gone into production with a new high-capacity H.T. battery. It is made in 60-volt units, and is capable of a steady output of 20/25 milliamperes. The list price per unit is 15s. 6d.

### PRECISION INSTRUMENTS.

This is the title of a new brochure issued by Messrs. Jackson Bros. It contains full details of all the famous J.B. variable condensers and associated fitments.

### "OMEGA" SUPER SWITCH.

"No more grating noises and bad contacts due to leaf springs weakening, nothing to go wrong, a slight turn of the switch knob, and you are through. Instantaneous contact, smooth, silent, and sure efficiency to the last degree. Foolproof contact arm can be instantly removed and placed in vest pocket, leaving set safe from interference. One-hole fixing."

Thus runs the leaflet accompanying the "Omega Super Switch," a component due to the Earl Engineering & Electrical Co., of Coventry. The switch retails at 2/-. This switch is a very simple affair.

There is an insulating knob fixed to an inch or so of threaded brass rod. This rod passes through a metal bush, which forms the one contact and screws down on to a bottom metal plate and thus makes contact with the second terminal point.

Slightly unscrew, and the contact is open; screw closer up, and you again make contact. It certainly is "wonderfully simple," and the contact it makes is a good one. The switching is efficient.

But I disagree with the Earl Engineering people when they say that the contact arm can be "instantly removed." Well, anyhow, I cannot remove it instantly, it took me ten seconds! However, it is quite a good little device, although I feel it fails in some intangible way. Perhaps it is that there is an absence of that nice click which we have learnt to associate with the definite operation of the modern switch.

### THE "UNDY" LOUDSPEAKER.

Not so very long ago I was deploring the fact that there seemed to be little progress being made in the design of ordinary loud speaker units.

Bearing this in mind, "P.W." readers will be able to appreciate my pleasure at receiving an "Undy" loudspeaker from J. Hemelik (sole agent), 8, Cullingworth Road, N.W.10.

The "Undy" is a breakaway from the conventional, and for this alone I consider is deserving of praise. It embodies an eight-pole loudspeaker unit, and it is this that is so refreshingly new in design.

There is a large cone, and this and the unit are solidly built into a stout but not cumbersome metal framework. This last, by the way, does not tend to resonate even when the speaker is handling hefty volume.

The "Undy" is sensitive, while it can, indeed, cope with a large input.

Including chassis, the "Undy" costs 50s., while the unit alone is obtainable for 25s.

The unit fixed to the usual semi-floating diaphragm à la conventional constructor's assembly gives really first-class results, and there is "moving-coil" bass when you fit a decent-sized baffle.

"P.W." readers should make a point of getting acquainted with the "Undy" loudspeaker unit—it is well worth their serious consideration.

You want to have the unit and chassis either built into a proper non-resonating cabinet or on to a baffle-board of proper dimensions, and not alone, for that is not a fair test for such a device.

### WHEN YOU ARE BUYING—

#### (15) AN R.C.C. UNIT

**Don't forget that the values of the resistances and condenser are very important and that they have to be chosen in relation to the characteristics of the rest of the circuit and to the valves which will be used.**

**That is, if good results are to be obtained.**

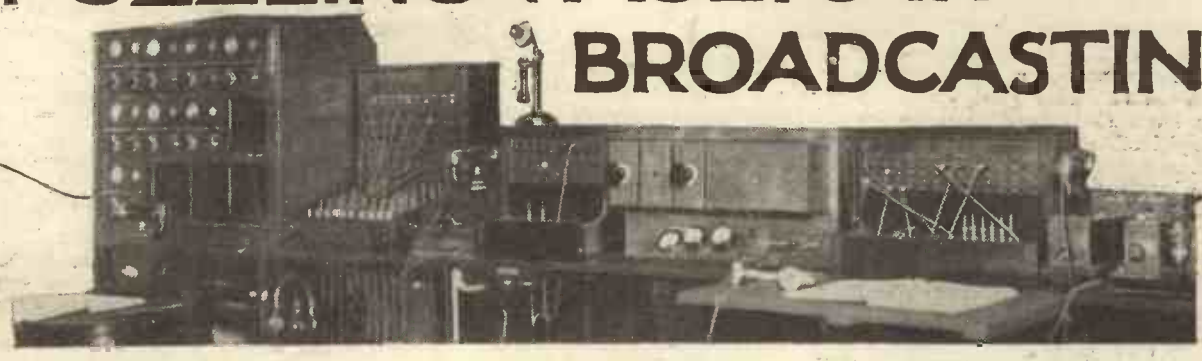
**Where values are not specified on the unit or in its descriptive literature, be prepared for anything in the way of results!**

**And if the specification is not backed up by a good name, likewise be prepared for anything!**

**Don't forget that the constancy of value and current-carrying capacity of the anode resistance in the unit may be of supreme importance.**

This is the "Undy" Loudspeaker.

# PUZZLING FAULTS IN BROADCASTING



**Our broadcasting engineers meet some curious little troubles in the course of their fascinating labours. But there are very few complete breakdowns, as our contributor points out, and some of these are completely unavoidable.**

**By CARDEN SHIELS.**

OFFICIAL figures published by the B.B.C. show that for last year, out of a total transmission service of 64,467 hours, the breakdown period only amounted to nineteen hours in all, or less than one-thirtieth of one per cent.

The working record of 5 G B, the experimental station, is not included in these figures, as it is less thoroughly equipped with spares and duplicate plant. A surprising consequence is that its breakdown time factor works out at about 18 times higher than the average for the other stations. Nevertheless, it is quite clear from these figures that actual deficiency or failure of plant is responsible for a negligible amount of bad service.

### Unloaded Lines.

A more serious cause of trouble lies in the landlines used for relaying programmes from one station to another. If a proper landline cannot be used, it is common practice to fall back upon an alternative line, which is usually not suitably "loaded" to transmit the full range of frequencies necessary for high-quality reproduction. Transmission suffers accordingly, since the improvised landline delivers poor quality current to the modulator feeding the local aerial.

Sometimes the landline difficulty is overcome by relaying the programme from the main station on a short-wave "wireless link." Here again the final transmission—though better than nothing, especially when the item is one of national importance—falls considerably below the quality attainable by the use of a properly-loaded line.

Breakdown inside the station may be due to failure of the main power-supply, which usually arises from causes outside the control of the station engineers. The smoothing circuits form another likely source of weakness.

### The "Rocky Point."

Or, of course, one or more of the valves may go. Power valves when worked in parallel "banks" are peculiarly liable to "flash-over" at what is called the "Rocky point." This usually occurs in water-cooled valves, and is due to an ionisation effect caused by traces of gas left in the valve after evacuation.

The gaseous molecules are broken up and the positive nuclei bombard the filament. For some unknown reason, the bombardment is usually concentrated at one spot on the filament, and causes the latter to heat up to such an extent that the electron stream is unduly increased. This in turn causes further ionisation until the filament is finally burnt out.

In burning out, the filament releases still more gas, which is immediately ionised and creates an abnormally large current. This promptly produces a miniature explosion or "flash-over" inside the valve, which completely wrecks the electrodes, usually smashes the bulb, and may even cause serious damage to other apparatus near by.

### Over-Modulated Foreigners.

Apart from "flash-over," ordinary overheating of the valves may occur, though this is usually guarded against by the provision of automatic cut-out devices, which open-circuit the main power supply when the temperature increases beyond the safety point.

Poor quality at the receiving end is sometimes due to excessive modulation at the transmitter, though little complaint can be made against B.B.C. stations on this score.

## GERMAN BROADCASTERS.

Dr. Knöpfke and Intendant Dr. Flesch (right), the Administrative and Artistic directors of the Berlin Broadcasting Company.

Foreign stations are the chief culprits in this respect, particularly the French, with perhaps Radio Toulouse heading the list. The incentive to over-modulation lies in the desire to secure maximum signal strength over the longest possible range, specially for the advertising programmes, which are often mainly intended for British listeners.

Another fault in broadcast transmission is that known as "frequency drift." Unless each station rigidly adheres to the carrier wave-length allotted to it under the Prague plan it is liable to interfere with its nearest neighbour in the frequency band, and set up heterodyne interference with all reception in the neighbourhood of the particular wave-length involved.

Here the Spanish and French stations seem to be the worst offenders, judging by the chart of frequency records prepared in the Brussels Laboratory of the Union Internationale de Radiophonie.

### Adding Echoes.

The remedy is to stabilise the radiated carrier-wave of each station by means of a piezo-electric crystal or by a master oscillator valve driven at constant frequency through a tuning-fork control. Constant-frequency devices of this kind have now been perfected to such a degree that they will "anchor down" a transmitting station to within one or two cycles in a million.

Defective quality in transmission can sometimes be traced to insufficient or excessive echo effects in the studio at which the rendition is taking place. Considerable improvements have recently been effected in this connection, particularly as regards the method and materials used for draping the studios. In addition, a separate studio is sometimes used, through which the original programme is passed so that the desired amount of "reverberation" can be added to the microphone current before it reaches the modulator.

A heavy fall of rain, snow or sleet may also seriously affect transmission by opening up a high-resistance leak from the aerial across the insulators to earth. Under these conditions the radiating power of the aerial naturally falls off enormously.

### Drying the Insulators.

In some aerial installations, measures are taken to remedy this defect by sending a special "drying-current" for a few moments through the aerial and leak-resistance path to earth. This current, by drying out the insulators, restores their efficiency.

When all is said and done, most of the faulty transmission heard from our own B.B.C. service can more fairly be attributed to imperfections in the landlines used for relaying than to any other single cause. Here the real source of weakness lies in the fact that the lines are chiefly carried overhead instead of being buried underground.

For this reason they are specially liable to suffer leakage and other losses.

# THE "C... ONE

**A receiver comprising a novel circuit, and many... word in simplicity. Desi...**

**THE "P.W." RE...**

WHAT is the one thing you want above all others in a wireless set? Selectivity? Power? Ease of handling? If you think it over you are quite likely to decide that, after all, the one essential feature which you want first of all is just *simplicity*. Whatever other good points the set may have, the greatest possible degree of simplification is surely the first consideration.

So many advantages follow when you have got simplicity, you know, that every designer of sets for home construction spends quite as much time in reducing his new ideas to their most straightforward form as in seeking for novel and meritorious ideas for improved receivers. It would be easy enough to produce all sorts of new and interesting receivers, quite likely of genuine merit, if one disregarded this requirement and allowed them to become complicated. The real difficulty lies in keeping them rigidly simple, and by simple we mean, of course, easy to build with a severely limited number of components and easy to operate with the smallest possible number of controls.

### NOTE THESE POINTS.

1. EXTREMELY SIMPLE CONSTRUCTION.
2. DIFFERENTIAL REACTION.
3. ADJUSTABLE FOR SELECTIVITY.
4. A DEMON FOR DISTANCE.

**The Limit of Simplicity.**

It may not be agreed quite unanimously that simplicity is absolutely the first requirement in any wireless set, but there can be no doubt that it must come very high up in the list. That being so it is sometimes interesting to set to work and build a receiver from a design which has been simplified down almost to the absolute limit, only stopping short at the point beyond which one would begin to sacrifice efficiency.

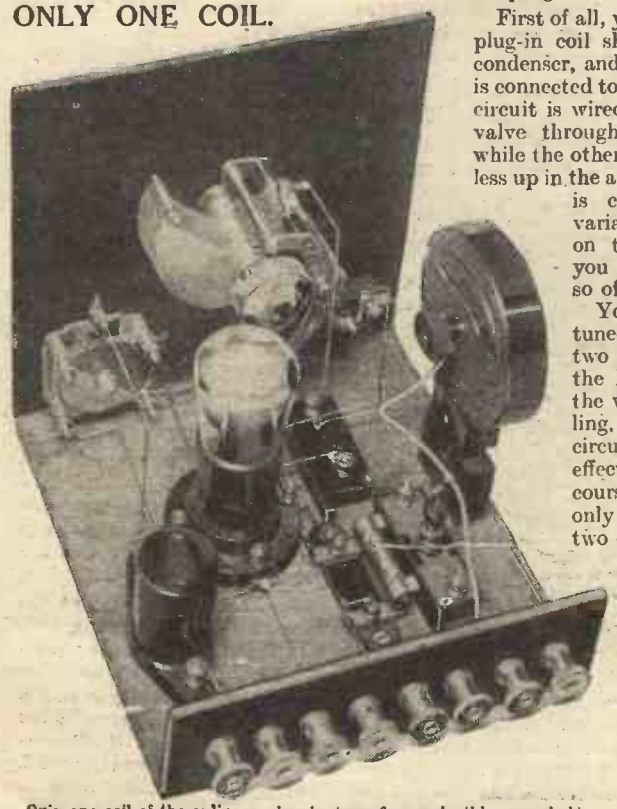
**Can It Be Done?**

Such is the design we are presenting to you this week for a little one-valve set which contains an extraordinarily small number of components, can be wired up in half an hour or so and yet possesses a circuit sufficiently unlike anything you have seen before to be decidedly interesting. Extraordinarily plain and simple as it is, nevertheless it contains such up-to-date features as differential reaction and fully adjustable aerial coupling capable of giving an excellent degree of selectivity, and it has given very fine results indeed on test.

If you will take a look at the photographs you will see just how simple it is, and you will be surprised to observe that it only contains just a single coil in spite of the fact that it has variable aerial coupling and differential reaction. That coil, moreover, is not a special one, but, on the contrary, is almost the simplest type of plug-in, namely, the centre-tapped variety.

If you were to tell some knowledgeable friend that you wanted all these features in a single-valver, and then ask him whether it could be done with only one coil, the answer in a considerable number of cases would be that it was quite impossible, yet, nevertheless, it can be done with a modified form of the Hartley circuit. This is rather an interesting point, so let us refer to the circuit diagram and see how it is done.

## ONLY ONE COIL.



Only one coil of the ordinary plug-in type figures in this remarkable little set, though this coil is, of course, used in a very special manner.

**Coupling the Aerial.**

First of all, you will note that there is the plug-in coil shunted by the usual tuning condenser, and the centre point of this coil is connected to earth. One side of the tuned circuit is wired to the grid of the detector valve through the usual grid condenser, while the other side of the circuit is more or less up in the air. To this free side the aerial is connected through a semi-variable type of condenser (placed on the baseboard), which gives you your control of coupling and so of selectivity.

You must imagine that the tuned circuit is really divided into two halves by the centre tap and the half remote from the grid of the valve is used for aerial coupling, also for a part of the reaction circuit. It is this combination of effects in the single circuit, of course, which enables us to use only one coil instead of the usual two or even three. To do so successfully naturally calls for a little care in the design, but the special devices we have adopted have resulted in a perfectly satisfactory arrangement, and in practice it works really well.

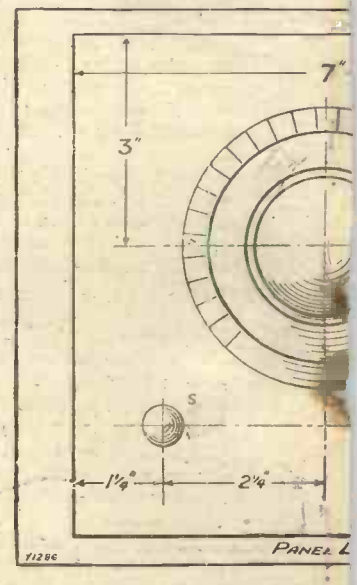
Now about those aerial coupling adjustments. You will observe that the aerial path to earth takes in half of the centre-tapped coil, and this would normally give you very tight coupling. The effect would be to give you fairly strong signals but very poor selectivity, and so we have included in series with the aerial lead the compression type of semi-variable condenser already mentioned. This only needs to be adjusted upon rare occasions, so we have placed it upon the baseboard in order to keep down the number of controls upon the panel.

VE... FE... PAR... NEE...

You will understand that the smaller the value at which this condenser is set the weaker the coupling to the aerial circuit and so the greater the selectivity. Do not forget, however, that if you make this capacity too small and so weaken the coupling excessively, signals will become rather weak. You should therefore endeavour to find such a setting for this condenser as will give you only just as much selectivity as you require and thus get the strongest possible signals available under your particular conditions.

Altogether, it is quite an interesting little circuit, and shows how much can be done with very simple appar-

ONLY ONE TUN...




## A SIMPLIFIED DESIGN O...

T."

ost modern features, that is, even so, the last
ned and Described by
SEARCH DEPT.

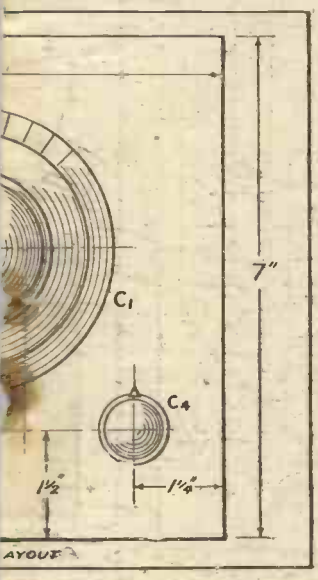
atus if one spends enough time in scheming and contriving. Its advantages in low cost and easy construction are quite obvious, and no less obvious is the fact that it is delightfully easy to handle. Moreover, the fact that there is only one coil means that going over from the ordinary wave-band to long waves and vice versa is so quick and easy that you really do not need wave-change switching.

RY
W
TS
ED

### A Good Starting Point.

Since this little receiver is so particularly quick and easy to build, it is quite likely that it will appeal to the comparative novices amongst our readers, so perhaps some constructional notes of a rather more detailed nature than usual will be acceptable.

NG CONTROL.




Briefly, this is how you should set about its construction. First of all, obtain a panel of the correct size, and proceed to drill it in accordance with the special diagram you will find on these pages. There are only three holes in it for components, so this will not take you very long, but we should like to suggest that your first proceeding should be to run quite a small drill through each hole, say a ¼-inch one. Then enlarge up each hole to the correct size for the particular component. This method which will be found particularly easy by those who have not had much experience in drilling holes in exact positions.

### Fixing the Panel.

Having got your three holes drilled in the right places and enlarged up to the correct sizes for each component and BEFORE you fix the components in place, you must arrange for the fixing of the panel to the baseboard. To do this, drill three or four holes in a row along the lower edge of the panel through which you can drive wood screws into the edge of the baseboard. The distance of these screw holes from the lower edge of the panel, by the way, should be fixed by the thickness of your baseboard, so that the screws may pass neatly into the centre of the baseboard.

Now attach the panel firmly to the baseboard, taking care to drive each screw well home, and then fix the three components in place upon the panel, these latter being the reaction condenser, tuning condenser, and on-off switch. Next turn your attention to the terminal strip, which is two inches wide and the same length as the panel. This you can cut from an odd piece of ebonite or purchase ready cut for use.

You will see from the wiring diagram where the terminals are placed, and you should drill corresponding holes along the strip. After this the terminals can be fixed in place, due care being given to tightening up the nuts thoroughly, after which the strip should be fastened to the baseboard in just the same manner as the panel.

### Not a Critical Lay-Out.

Next, with the aid of the wiring diagram, lay out your components exactly as they were placed in the original set and screw them down. This will not take you more than a few minutes if you have on hand a suitable collection of small brass screws. The wiring diagram will probably enable you to fix the position of these components quite accurately enough by eye, but if you like to make a close and careful copy of the original set you can use the scale which is provided on this same diagram.

Having got all your components mounted up in place, there just remains the job of wiring up, and this you will find is a particularly quick and simple business. The material can be either bare tinned copper wire of about No. 18 gauge, or insulated material such as Glazite, or bare wire encased in Systoflex. There is only one hint which we can give you in this connection, and that is to the effect that if you are not quite confident of your ability to make a really perfect soldered joint, you should not attempt any soldering whatever, but screw down each lead under the terminal nuts or screws of each component.

### This is Important !

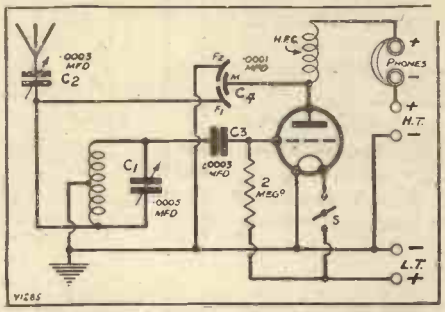
When all the wiring is finished, restrain your impatience to put the set on test for just a few moments more, and take a pair of pliers and go over every one of those nuts which hold down the wires and give it a good sharp twist to make certain that it is quite tight. A few moments spent in this way may save you hours later on trying to trace faults and crackling noises.

Now for the first test. In the coil socket you require a centre-tapped plug-in inductance of size No. 60 for the lower waveband and 250 for the long waves. The valve should be of the H.F. type with an impedance of perhaps 20,000 to 30,000 ohms, a good alternative being the R.C. type provided that it has not too high an impedance, say 40,000 to 50,000 ohms.

The H.T. voltage need not be more than about 60, so that an ordinary 60-volt unit

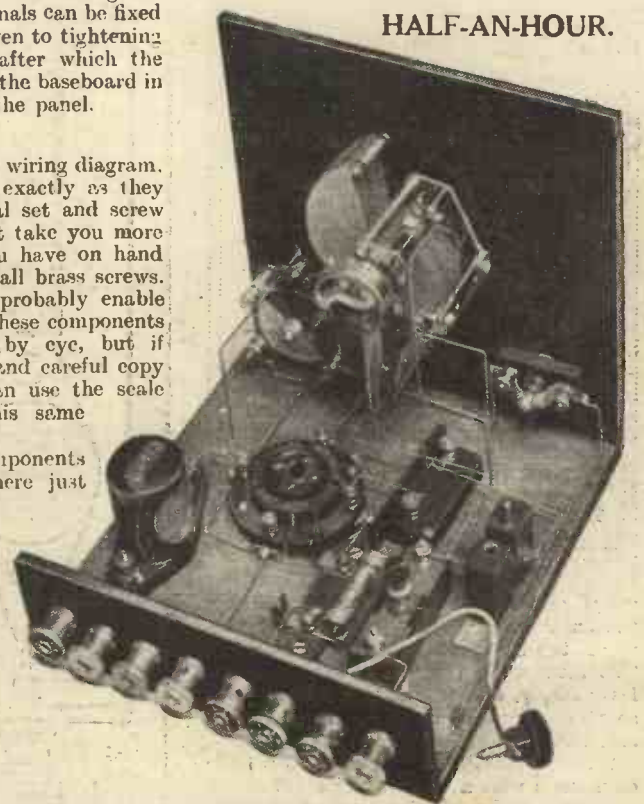
(*Continued on next page.*)

## A FINE CIRCUIT.




Variable aerial coupling and differential reaction are made possible by an ingenious modification of the Hartley circuit.

## HALF-AN-HOUR.



You should be able to wire up this receiver in about 30 minutes, even if you have had but little experience of set assembly.

## EXCEPTIONAL POWER - -

## THE "C.T." ONE.

(Continued from previous page.)

will be quite sufficient. You should adjust the actual voltage by means of a plug tried in the various sockets of the battery in the usual way to obtain perfectly smooth reaction. This is the only preliminary adjustment, and you are now ready to set about tuning-in the local station. To do this, the first thing to do is to set the reaction at minimum, that is to say with the knob turned fully to the left. Then, set the compression type variable condenser, $C_3$ at maximum, which means that its knob should be fully screwed down.

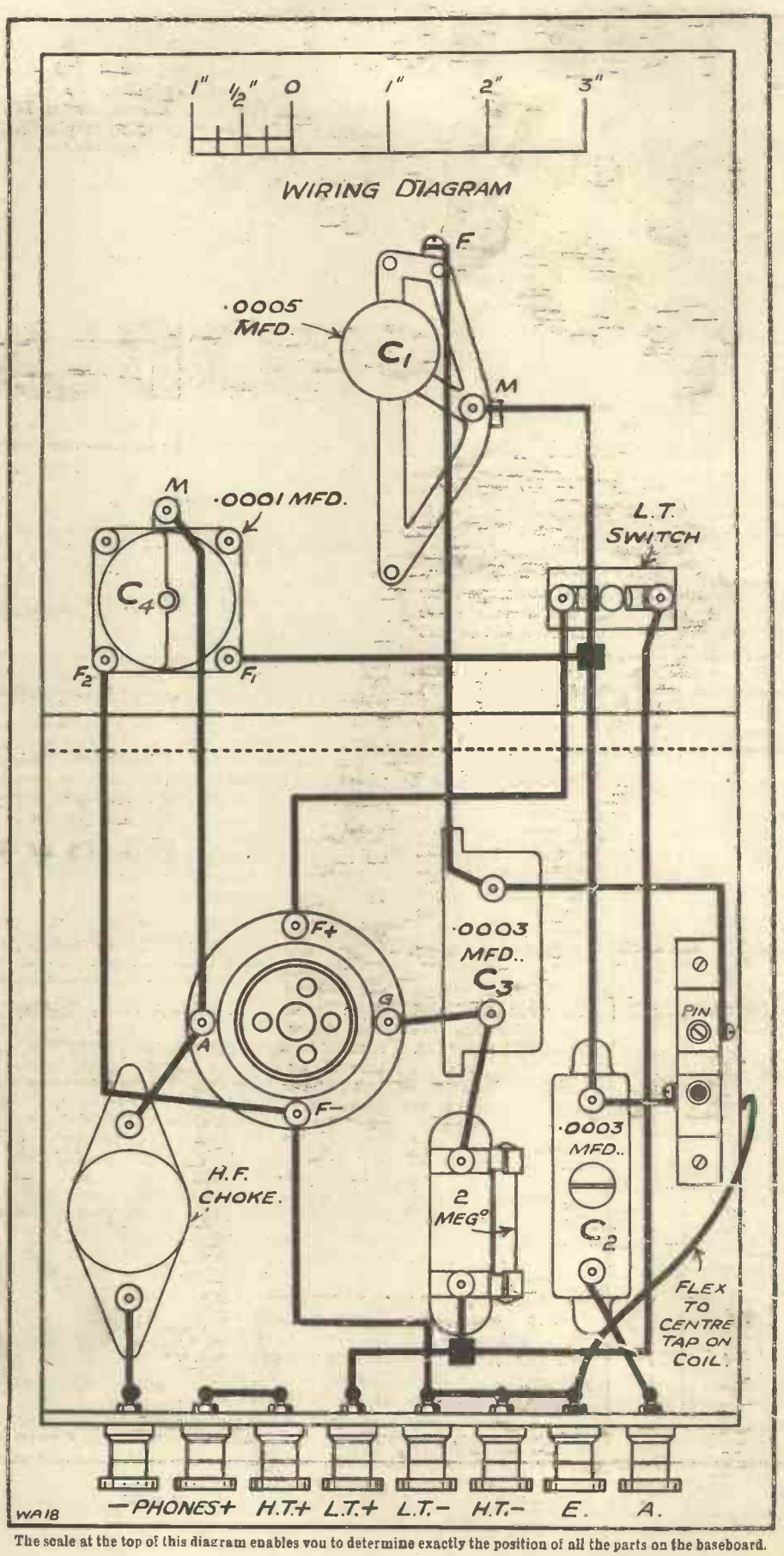
### Getting Selectivity.

Now vary the adjustment of the tuning condenser until you pick up the local station. It will probably be very loud, and will spread over a good deal of the dial, so you should now turn to the series aerial condenser, and gradually unscrew the knob until you find you are beginning to get the amount of selectivity you want. The local station will now tune more or less sharply, and will not spread so much, so you can proceed to search for distant stations.

This is a matter calling for just a little experience with a single valve set, because you must make judicious use of reaction. All you have to do is to use reaction so as to keep the circuit just a little way below the oscillation point (taking care never to allow the set to oscillate while you are searching), at the same time very gently and gradually turning the tuning dial, using just the finger-tips to reduce hand capacity effects.

### COMPONENTS REQUIRED.

- 1 Panel, 7 in. × 7 in. (Resiston, or Goltone, Keystone, Paxolin, Trolite, etc.).
- 1 Cabinet with baseboard 7 in. deep (Pickett, or Camco, Osborn, Gilbert, etc.).
- 1 ·0005 mfd. variable condenser, slow motion or plain type with vernier dial (J.B. or Lissen, Lotus, Dubilier, Ormond, Burton, Ready Radio, Colvern, Igranic, Formo, etc.).
- 1 ·0001-, ·00013-, or ·00015-mfd. differential reaction condenser (Lotus, or Lissen, Ormond, Ready Radio, Keystone, Dubilier, Formo, Burton, etc.).
- 1 On-and-off switch (Pioneer or Lissen, Igranic, Benjamin, Lotus, Ormond, Wearite, Keystone, etc.).
- 1 Valve holder (W.B. or Igranic, Burton, Lissen, Benjamin, Lotus, Precision, Wearite, etc.).
- 1 Coil holder (Wearite or Lotus, Lissen, Keystone, Igranic, Magnum, etc.).
- 1 Compression type Condenser max. cap. ·0003 (Formo Type J, or equivalent R.I., Igranic or Lewcos type).
- 1 ·0003 mfd. Fixed Condenser (Lissen or T.C.C., Dubilier, Goltone, Mullard, Igranic, Atlas, etc.).
- 1 2 meg. leak and holder (Lissen or Dubilier, Ediswan, Igranic, Mullard, Graham-Farish, etc.).
- 1 H.F. choke (Lissen or Varley, Lewcos, R.I., Dubilier, Igranic, Ready Radio, Lotus, Keystone, Climax, Colvern, Wearite, etc.).
- 1 Terminal strip, 7 in. × 2 in.
- 8 Terminals (Eelex, or Igranic, Burton, Belling and Lee, Clix, etc.).
- Wire, screws, flex, etc.




The scale at the top of this diagram enables you to determine exactly the position of all the parts on the baseboard.

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| ,, Amps | 0.4 | Mutual A.C. Conductance (MA/V) | 3.7 |
| Max. H.T. Bat. V. | 150 | | |
| Amplification Factor | 7 | | |

Constants taken at Ea=100, Eg=0.

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# CAPT. ECKERSLEY'S QUERY CORNER

HALF- OR FULL-WAVE?—TRANSFORMER CORES—PREVENTING L.S. BOOM — AERIAL INSULATION — A QUESTION OF VOLUME CONTROL.

**Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., Late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.**

### Half- or Full-Wave?

D. M. B. (Highgate).—"Do you consider that my best plan when constructing an H.T. eliminator is to use one full-wave rectifying valve, or two half-wave, arranged in such a manner as to give an equivalent output in each case?

"If there is little to choose between these two schemes, why is it that half-wave valves are manufactured?"

I think the double wave a bit better because it takes less power from the mains and is easier intrinsically to smooth; requires, in fact, less of chokes and condensers.

There's one subtle point, however, which is sometimes missed. The double-wave gives a variation equivalent to a frequency of 100, the single 50. The loud speaker which produces your music is more sensitive to 100 cycles than to 50 (in all probability), and so you *may* get more hum with double-wave. Get plenty of smoothing, when the point does not arise, and the double wave gives you slightly better efficiency.

* * *

### Transformer Cores.

A. R. C. (Hull).—"Why are the iron cores of transformers and low-frequency chokes laminated, and the laminations packed so tightly into the bobbin?"

When an alternating current is passed through a coil, it creates currents in neighbouring conductors if these present a circuit.

The creation of these currents involves energy expenditure, and so reduces the inductance of the winding.

The iron core of an inductance is a conductor. The loss by eddy currents is reduced by laminating the iron core, and the effective inductance increased.

The laminations are packed tightly so that they won't budge under the influence of magnetic forces or fall out of the winding!

* * *

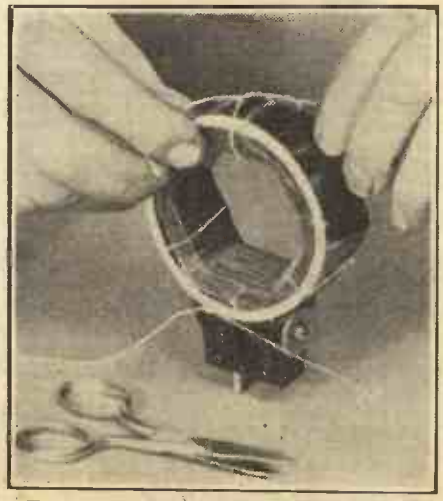
### Preventing L.S. Boom.

A. L. (Brighton).—"What precautions should I take in fitting a loud speaker into a radio gramophone cabinet, in order to prevent 'boominess,' valve 'ringing,' and similar annoyances?"

Cavity boom is reduced by lining the space behind the loudspeaker with thick felt. Shock excitation of the valves can be minimised by making the attachment of the loud speaker to the frame of the machine through rubber, and by using spring valve holders, and shielding the valves from direct contact with the sound. (Enclose the receiver.)

It's all a matter of common sense, knowing that vibration to the valves from the loudspeaker can only be carried either by a sound wave through air (therefore block off the loudspeaker cavity and the receiver valves from direct contact with the sound-laden air), or by vibration through the cabinet (therefore do not let the loudspeaker have hold of the cabinet anywhere).

## CUTTING OUT INTERFERENCE



Here you see how a home-made aerial coil is fixed to an ordinary tuned grid coil to sharpen tuning. Use string or cotton for fixing and replace the grid coil in the set. Then one end of the new coil goes to the aerial, the other end to earth, and the job is done.

### Aerial Insulation.

F. N. S. (Williton).—"Is it correct to assume that the efficiency of an aerial's insulation will be increased by the use of additional insulators in series with the existing insulators. Would these extra insulators improve the reception of the broadcast programmes?"

It is true that insulators in series increase the insulation of an aerial or any charged conductor. If you are insulating a conductor which rises to 100,000 volts above earth potential, you have to have lots of insulators in series, or one very big insulator, to stop the flash-over.

But a very small insulator is sufficient to stop flash-over when the voltage is low, and adding insulators in series is redundant. The insulator, however, gets coated in certain cases with carbon deposit, and while with a receiving aerial there will never in normal cases be flash-over, there may be leakage.

In this case, insulators in series might pay, but in the generality of cases no good would be served. Really if insulators get very dirty on a receiving aerial they can always be cleaned once a year or so. A receiving aerial is only charged to a fraction of a volt in any case.

It's like asking if it would be better when damming a mill stream to build something like the Assouan dam—No! a small dam is enough, but even though that small dam may hold the water if the dam is leaky, it's better to repair it than to build it (of leaky material) bigger.

* * *

### A Question of Volume Control.

L. D. (Southport).—"In choosing my post-detector volume control, would you advise me to place a variable resistance across the primary of the L.F. transformer (which follows the detector), or a high resistance potentiometer across the secondary?"

Put a *very* high resistance across the secondary, because anything in the primary is at high tension (you may get shocks), and is carrying currents, so that varying it gives you clicks or rustling noises.

The secondary is at low potential and with a proper grid bias and following valve, carries no current. But its a bad plan (unless the makers advise it) to load an intervalve transformer severely, and so the potentiometer must be of very high resistance—ask the makers what value they advise.

By the way, how does it strike you to have a volume control in your loudspeaker leads (assuming the loud speaker carries no current)? You've probably got to take a lead out from your set for the loud speaker, you can extend this to a volume control, and you can have that volume control by your chair.

On the frequent occasions you want zero volume you don't have to get up. By turning to very weak you can wait for the item you want and not be irritated by that you do not want.

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*The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

# QUESTIONS AND ANSWERS.

### MAKING A CRYSTAL SET SELECTIVE.

P. R. T. (Hounslow, Middlesex).—"As the crystal set which they use is a gift from a friend, they particularly do not want it altered. But they want to add a sort of sharpening unit or tuner to sort out the two programmes which now come in at practically equal strength.


## CAN WE HELP YOU WITH YOUR SET?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this, an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made by 'phone, or in person at Fleetway House or Tallis House.


"It is impossible to listen to a talk on either station when music is being played at the other. Coils, condensers, etc., I have in plenty, how can I use them?

"Is there a unit which I could hook up in front of it which will enable them to select one station in favour of the other, without cutting down the aerial or altering the inside of the set?"

A selectivity unit of this kind is very easily constructed. All you need is a 50-turn coil (or thereabouts), and a .0005 mfd. tuning condenser, three terminals, and a neutralising condenser.

Mount the coil and the tuning condenser close together in some convenient fashion and join one end of the coil to one side of the condenser, and the other end to the other side. On the front of the unit arrange the three terminals, one marked aerial, and the others being $A_1$ and $E_1$.

Join one side of the neutralising condenser to $A_1$ and its other side to one side of the coil-and-condenser combination, and to the aerial terminal. The $E_1$ terminal is joined to the opposite end of the coil and opposite plates of the condenser.

This finishes the construction of the unit, and all you have to do now is to take the aerial lead from the aerial terminal of your receiver and put it to the aerial terminal on the unit. Then run a lead from the $A_1$ terminal on the unit to A on the set.

$E_1$ is joined to the earth terminal on the set.

Now set the neutralising condenser near its minimum, and you will find that in order to get either of the programmes you must tune both the unit's condenser, and the set's condenser, before it can be heard. Mark the new dial readings, and then look for the other station which also you will find is sharply received on both dials.

When once the appropriate dial figures have been ascertained, you can always receive either station clear of the other by setting the two condensers at these settings.

The setting of the neutralising condenser will be found to govern the degree of sharpness of tuning. If it is too small this dial-setting will be very sharp indeed, and you will be getting a greater degree of selectivity than you require. (This is unlikely even at its minimum.)

If your set the neutralising condenser to too large a value you will not be getting the full selectivity of which the arrangement is capable, so when you first instal the unit you should experiment with the set and the neutralising condenser until the necessary degree of selectivity has been obtained.

After that the whole of the operation of changing from one station to the other is always carried out on the two dials.

### USING AN INDOOR AERIAL.

F. R. G. (Mitcham, London, S.W.).—"When we moved to the new house here from Berkshire, I brought the wireless set along, intending to erect a mast as soon as possible. I have had the L.T. battery charged and kept the old H.T. battery, so the other night, after a hard do at painting the kitchen dresser, I thought I would like to listen to Leonard Henry.

"Just for curiosity, I connected up the batteries to the set, which had not been properly unpacked till then, and then hooked a 40-ft. length of fine wire to the aerial terminal and another shorter piece of the same stuff running to the earth tap.

"To my astonishment I got enormous strength. The wire was only laid round the picture rail, and I have left it there, as I do not think an outdoor aerial could possibly be better. The earth gave a bit of trouble in working loose until I made a tight job of it, but as I had always understood an indoor aerial was inefficient, I cannot make out where I get such tremendous punch from.

"Why is it that it seems so efficient when it is so little trouble to run up as compared with an outdoor aerial and there is no bother about insulation?"

The extra punch which you are getting is not solely due to your aerial but to the fact that you have moved from a comparatively long distance from a station to a district which is comparatively close. In such circumstances even a poor aerial will give better results than an aerial which is fundamentally much better, but which is situated farther away from the transmitting station.

Although at present you have been lucky with your indoor aerial, you should remember that insulation with this type is just as important as with an outdoor aerial, for although it may appear to give satisfactory results for a time, it is very liable to develop a fault unless it has been properly installed.

You have already experienced the ill-effect of poor contact in the earth lead, and as the aerial is in the same circuit and is just as important in the part it plays towards good reception, we advise you to take a little trouble in installing this, rather than rely upon the first haphazard arrangement. It is quite possible that if you place the wires away from walls, etc., or arrange them in a loft, you would get far greater strength of reception than at present.

In any case you would be no worse off, so we should certainly try the indoor aerial in different positions before assuming that you have found the best possible arrangement by chance.

### BACK NUMBERS OF "P.W."

E. T. (Hartlepool).—"Where do I send for the May 3rd issue of 'P.W.'?"

Back numbers of "P.W." are obtainable from The Amalgamated Press, Ltd., Back No. Dept., Bear Alley, Farringdon Street, London, E.C.4, price 4d. per copy, post free.

### THE LENGTH OF THE AERIAL.

J. S. (King's Lynn).—"I notice that the length is fixed by the P.M.G. at 100 ft. Is there any reason for fixing this particular figure, or was 100 ft. a convenient sort of length which was fixed in the past and has never been revised in the light of present-day experience?"

The points raised by you were covered in the following extract of a letter from the P.M.G. to the Technical Editor of "P.W.":

"Concerning wireless aerials, I am directed by the Postmaster General to say that the present restriction (limit 100 ft.) was imposed on the recommendation of an Inter-Departmental Committee in 1919, when facilities were granted only for experimental purposes. The limit was originally 100 ft. for single wires and 140 ft. of wire where two or more wires were used; but when later the length was calculated without reference to the number of wires used, the second alternative was no longer necessary. The limit was imposed with the primary object of reducing interference as much as possible while at the same time allowing all reasonable facilities for experiment and research. Authority is given to exceed the limit wherever special justification is shown."

*(Continued on page 302.)*

## WHAT DO *YOU* THINK ABOUT THIS?

**A Colchester reader of "P.W." who uses an S.G., Det., 2 L.F. set, had it arranged for anode-bend or grid-leak rectification by means of a flex lead from the detector's grid. (When placed in one socket the grid was joined up to a grid leak, and when placed in the other socket to an anode-bend circuit.)**

**This worked excellently (both ways) for months, and then suddenly the set lost power, and seemed erratic. Sometimes anode bend became better than G.L., and sometimes the reverse, but neither gave satisfaction, nor approached the old standards of strength and stability. All the components, etc., were unaltered, and all appeared O.K. Can you imagine**

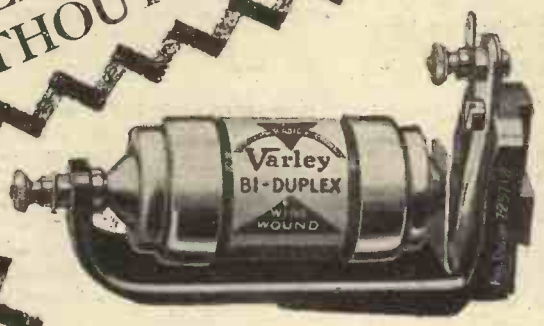
**WHAT WAS WRONG?**

**N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to above next week.)**

*Last week we told of an Edinburgh reader's bother with an H.T.+ lead spark. And we asked "Could you have told this puzzled reader what was wrong?"*

*Perhaps you rightly-guessed that nothing was wrong. For he was using a large by-pass condenser across his battery, and in such cases a spark is usually noticed when the H.T. plug is moved. It is nothing to worry about.*

"NEARLY 5 YEARS WITHOUT A FAULT"

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***Write for Section B and C of the Varley Catalogue which gives details of the Varley range of Anode Resistances, varying from 5,000 to 500,000 ohms.***

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# RADIOTORIAL. QUESTIONS AND ANSWERS

(*Continued from page 300.*)

### A FOUR VALVE SET.

N. E. (Harbourne)—"Can you put me wise as to where I can get details for building an inexpensive four valve set, one H.F., detector, and two L.F.?"

Full details of a set of this type will be given in "P.W." next week. It is the "Neutype" Four, and, N.E., you will find it to be one of the most attractive "Fours" that have been brought forward for a very long time.

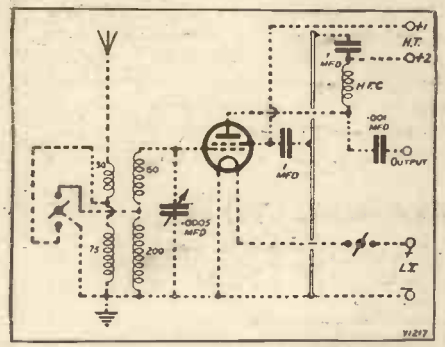
### VARIABLE RESISTANCE FOR THE CHITOS.

L. R. R. (Winchester).—"I am making up the famous "Chitos" one valve set which was recently referred to in 'P. W.' Instead of using a 20,000 ohms variable high resistance to control the reaction, I wish to use a tapped resistance which I have on hand.

"The total value of this is 50,000 ohms, and there are twelve taps of about 4,000 each. Do you think this would be O.K. for the Chitos?"

Quite O.K. so far as values are concerned. Actually a continuously variable oscillation control would be preferable, but if you incorporate a filament resistance you will find that much of the reaction control can be done on this, so that your oscillation control can be used for the rough adjustment and the final adjustment made on the filament resistance.

## POPULAR "WIRELETS" No. 10




**DID YOU GET IT RIGHT?**

**The dotted lines show how last week's "Wirelet" should be connected for an H.F. unit, with a shorting switch to cut out the long-wave coils when necessary.**

"VERY PUZZLED" (Clapham, S.W.).—"When I was going over the final connections to check up I discovered that the valve holder is not the ordinary arrangement. The round base of this, which goes on the actual base-board, is the usual arrangement of grid terminal opposite the plate with the two filaments opposite each other (and rather nearer to the grid terminal).

But the wobbly piece in the centre of the valve holder has the two filament sockets in line with grid and plate, terminals and markings. I have wired it up, but thought it was best to ask if it is O.K. before I try the valve in it?"

Well done! You acted very wisely in suspecting that all was not well with that valve holder, for although such a fault is rare it is an exceedingly expensive one unless it is noticed!

Apparently what has happened is that in assembling the two parts of the valve holder the centre was inadvertently given a half turn before being fixed to the base. The probability is that had you placed a valve in the holder in its present condition, and then switched on, you would have spoilt your valve!

Your best plan is to cut the wiring or unsolder it again, and take the valve holder back to the dealer from whom you obtained it, or send it to the manufacturer. No doubt they will gladly give you another one in return!

### THE SECOND TUNING CONDENSER.

"LUCKY JIM" (Great Warley). "I really am lucky Jim, for I have just been presented with a one valve set complete. It belonged to the son of a friend of my father's, and as he has just been sent abroad they turned it over to me.

"It is evidently a 'P.W.' design, as far as I can make out, for it has one of the Titan coils in it, and a wave-trap employing an X coil. I am enclosing the circuit as far as I can draw it, and you will see the point that puzzles me is the extra condenser for the wave-trap and also for tuning.

"In the case of the wave-trap condenser, it is only a compression type right across the other one, but in series with a plug and socket brought out to the panel.

"The main tuning also has a condenser in series with a plug and socket across it, but in this case it is a reaction condenser. What is the reason for these extra condensers, without which the circuit works perfectly normally?"

The design to which you refer was an easy wave-change one valver called the "Switch-over," and it was specially intended for use in regional areas. The idea was that you could change over from one regional station to another by putting in or taking out the capacity required to go from one wave-length to the other.

For instance, when tuning in the plug and socket connection is broken, the ordinary tuning condenser covers the ordinary wave-lengths, and will require to be set at a certain reading for the National programme.

Leaving it at this, if the plug connection is now restored, the other condenser is placed across the first one and will increase the capacity to a certain extent (depending upon how it is set). You can quite easily adjust it so that it brings in the Regional programme.

When this has been done, all you have to do to bring in the National is to pull out the plug on the panel. Thus the change-over can be made even by anyone who is inexperienced in a second. The extra cost is only that for a plug and socket and the extra condenser (which can be of the compression type), and the ordinary tuning condenser is not affected in any way when the plug-socket is broken, but can be used as usual for distant reception.

Similarly with the wave-trap, in which the ordinary condenser can be set to cut out the National programme and then placing the plug in the socket will bring in the other condenser which can be adjusted and utilised to cut out the Regional station. Although the scheme is so simple it has proved extremely satisfactory in use.

### SIMPLE WAVE-CHANGE SWITCHING.

R. M. (St. Albans).—"I get all the quality and strength I want with a one-valve amplifier following a crystal. I use a three to one transformer, and a permanent type crystal detector.

"The accumulator and H.T. batteries last for a long while, and the only spot of trouble I do get is in changing the coil. I like to listen to both long and short waves, because I find the National much better on long waves when oscillators are about, and I am keen on quality. The only difficulty is changing the coil and altering the aerial on the X tapping. (I use a 60 for ordinary wave-lengths, and a 200-turn for the long waves.)

"Thinking I could change over by means of two separate coils, I purchased two coil holders, as shown in my sketch, and a six-contact, two-way switch, but now I cannot quite see how to work it so that throwing over the switch changes the coil without interfering with the rest of the apparatus. What are the connections?"

Join one of the centre contacts of your switch to crystal and one side of the variable condenser. The opposite centre contact goes to the aerial. When you throw the switch over to the left two more contacts are joined up. The one opposite the aerial centre contact goes to the X tap on one coil and the other to the socket of the holder for this coil.

When the switch is thrown over to the other side, the X tap of the other coil and the socket of its holder is joined up in a similar manner. Finally, join both the pins of the coil holders to earth.

To change from one hand to the other, all you have to do now is to throw the switch over from one side to the other.

### HAVE A CIGARETTE?

C. S. (Oxford).—"A friend came in to help me put the set up for the first time, and when we got the aerial finished we went indoors for a breather, and I said, 'Have a cigarette?' It was a silver cigarette-case and, not knowing any better, I laid it down on the H.T. battery. Immediately there was a spark across this. My friend was highly amused, but, although the set is going perfectly and everything seems O.K., I am wondering whether any real damage was done?"

Fortunately, an H.T. battery is a pretty sturdy piece of apparatus! By connecting two or more of its plugs together you short that section of the battery, and this treatment would very quickly ruin it.

If you snatched away the metal immediately there was probably not much harm done, although, of course, it is distinctly damaging to the battery to treat it in this way. So it is a good plan to keep it either *inside* the cabinet, or else provide it with a cover, so that inexperienced people may not lay scissors, on it or knitting-needles, or any similar conductors.

If this happens the battery may quickly be "run down."

### SCREENED GRID VOLTAGES.

A. M. (Hertford).—"Acting on 'P.W.'s' advice, I was giving my set a sort of belated spring clean, and opening up the plugs for the grid bias, etc. Quite by accident I replaced the screened grid H.T.+ lead at 54 volts, instead of the usual 80. To my astonishment, the set seemed to go far better like this.

"For several nights I had Algiers at terrific strength, whereas before I had only heard him once, and that was weak. All other stations seemed better, and, in fact, I think the set is a little better on the local, too. As 80 is advised, why is it that 50 gives better results?"

Although in ninety-nine cases out of a hundred the figures by the makers are the best working figures, it must be remembered that these are given as a guide, and that in such highly complicated pieces of apparatus as a valve it is impossible for the manufacturers to say *exactly* the best voltages, adjustments, etc., that will be required in a given set of circumstances.

In fact, as "P.W." has often stated, it is up to the user to spend a little time and trouble in finding out what voltages, etc., are best for his own particular valves.

You will probably find, too, if you consult the maker's chart again, that the voltage of 80 is the *maximum* voltage that should be applied, inferring that a greater voltage than this may be harmful to the working of the valve; but obviously a smaller voltage can be tried, and if the valve works better with this, so much the better for the battery, and for you.

As to why it works better with a smaller voltage, it is impossible to say, because this depends upon the circuit which is being employed, the components, strength of input, exact bias, precise position of the electrodes inside the valve, and other factors. The point is, however, that a small H.T. voltage is nearly always an advantage on the H.F. side, for it reduces battery drain and probably results in slightly quieter operation.

## TECHNICAL TWISTERS

### No. 11.—FADING.

**CAN YOU FILL IN THE MISSING LETTERS?**

Fading is due to the vagaries of the . . . . . .

True fading is only noticeable when receiving from a . . . . . : station.

There is less fading on . . . . waves.

Fading is more often noticed at . . . . . than by . . .

Fading is particularly noticeable at . . . . . and . . . . . .

**Last week's missing words (in order) were Positive; Greater; Reaction; Popping; Slider, Potentiometer.**

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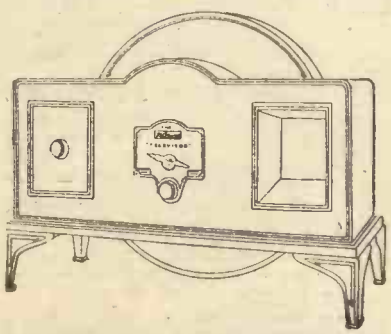

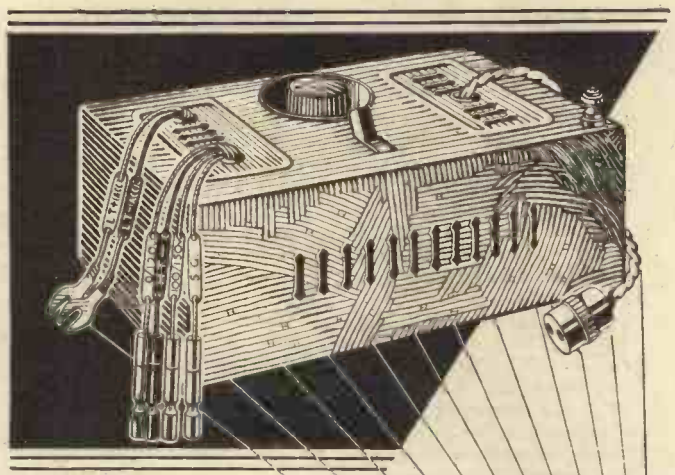

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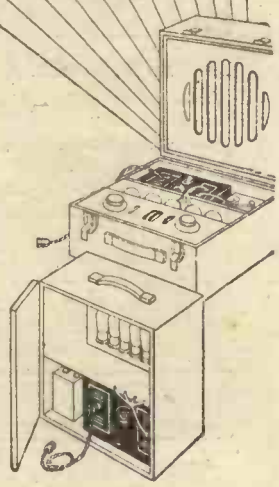

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288

## FOR THE LISTENER.

(Continued from page 286.)

remained among the musical illiterates." He was in a very severe humour—usually so gentle a soul.

But I have observed that when gentle souls "see red" it is usually vermillion! Any of the younger composers who happened to listen to him must have been badly peeved. "It is no use seeking for a new means of expression," he said, "unless you have something to express!" Apparently he thought that most of them—William Walton was an exception—hadn't!

**A Good Story.**

Vernon Bartlett told a good story to illustrate the sort of education which children are getting in some of the fire-brand States in the Near East. A child was asked in an examination paper to describe a cow. He wrote, "A cow is a square animal with legs at each corner; but give me Liberty or give me Death!" Full marks for the little fire-breather! Help!

**The New York Touch.**

Mr. Cecil Lewis warned us before the broadcast of "The Four Feathers" that his production would probably show American influence. It was very speedy; so speedy, indeed, that the play finished some minutes before the allotted time.

Short scenes, excellently chosen, succeeded each other rapidly with all the ease and continuity of the cinema. There are breathless moments in the story, and they came over breathlessly. It was an interesting, and I think successful, experiment.

The weakness seemed to me to be two-fold; one had very little time to savour either the characters or the scenes; and the play must have been much more understandable by those who knew the story beforehand than by those who were hearing it for the first time.

**An Accident in the Studio.**

Mr. Harold Nicolson during his talk the other evening—which of course nobody who wants entertaining ever misses—kicked the microphone over! I wonder if that has ever been done before! And I wonder how he managed to do it! He himself was not in the least upset.

"I hope it hasn't upset my voice," he said, not as one who had for a moment disorganised the Universe! He made, that night, the loveliest "curtain." After describing the dreary speech-making at a banquet at which he had been present, and allowing you to apply the words to his own effort, "so," he said, "e'en the weariest speech winds somewhere safe to sea!" And blacked out!

**At The Piano.**

I have had much pleasure from Maurice Cole's playing of Mendelssohn during the week; as this young pianist grows older he becomes deeper, and his playing, which was always excellent in technique, becomes more and more satisfying.

Also from Marguerite de Pachmann's recital the other day. She is a newcomer to the microphone. I hope she may come often. She played, among other things, Chopin's Ballade in G minor as well as ever I heard Pachmann himself play it—and I can think of no higher praise.

## USING SAFE-POWER UNITS.

(Continued from page 285.)

You must then take the following precautions. And, by the way, many of these should be taken *whatever* power arrangements you are served with. If you use an earth connection, this must be broken by a series fixed condenser of a calibre that will enable it to withstand the full supply pressure. There should also be a fixed condenser of the mains type in series with your aerial lead.

The L.T. battery should be accommodated in a stout wooden box, and its leads carefully insulated and protected. And while the set is in operation no one must touch *any* metal part of it. When you adjust the tuning dials see that your fingers do not come into contact with the head of a screw. If the set has a metal panel, keep well away from it.

**Safe and Economical.**

When the mains unit is switched on the *whole* outfit is *alive*. "When the mains unit is switched on the *whole* outfit is *alive*." Remember that sentence.

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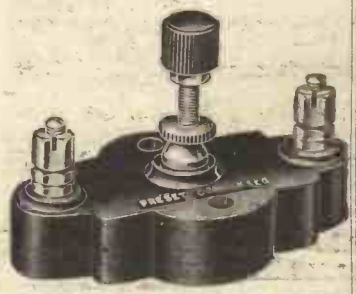

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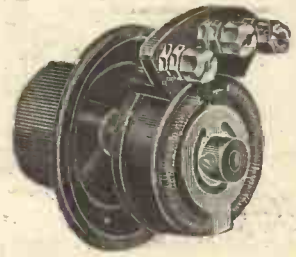

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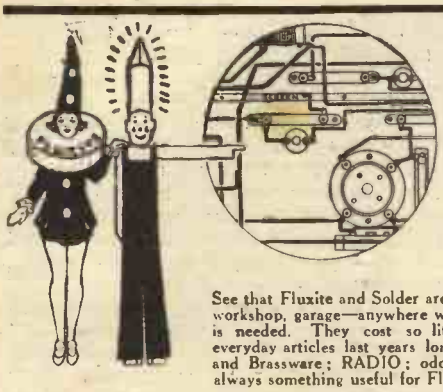

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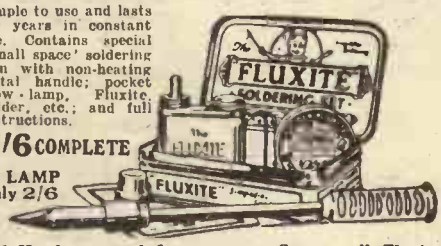


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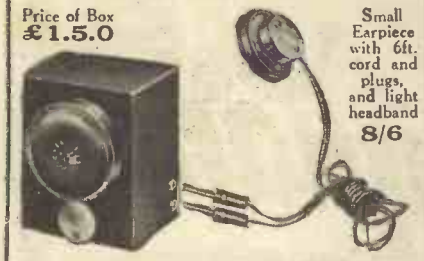

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# TECHNICAL NOTES.

**By Dr. J. H. T. ROBERTS, F. Inst. P.**

IN view of the great importance and popularity of the screened-grid valve, it is interesting to recall how these valves came to be developed to their present state.

Before going further, I should say that they are sometimes referred to as "four-electrode" valves, and although this is, in one sense, a correct description, it should be remembered that the term "four-electrode valve"—in this country, at any rate, is commonly understood to refer to a valve of a different type.

It is better, therefore, to avoid the term "four-electrode valve," and to use the accepted description of "screened-grid valve." A German physicist named Schottky experimented with valves of this kind some years ago, and more recently two well-known American radio engineers, Hull and Williams, of the General Electric Company, continued this work and produced all kinds of models of four-electrode valves for different purposes.

### Amplification Factors.

In order to appreciate the value and importance of the screen grid we should first consider the drawbacks of the ordinary three-electrode valve. For amplification purposes this is definitely limited to a low "mu" or amplification value, owing to the electrostatic capacity between the plate and the grid.

The plate and grid act as the plates of a condenser and at broadcast frequencies this condenser action is sufficient to cause a considerable back-leak from the plate to the grid, which reduces signal strength and also produces distortion and howling.

Although the ordinary three-electrode valve often has an amplification factor up to perhaps 6 or 8, it is actually possible to make a three-electrode valve with an amplification factor of 200 or even up to 300. Such valves have, in fact, been made, but they are virtually useless for broadcast frequencies.

### Electrode Capacity.

It then became necessary to find some means of overcoming the inter-electrode capacity effect mentioned above, and it was found that if another electrode were introduced, so as to screen the plate electrostatically from the ordinary or control grid, the effect was practically overcome. This screen grid must, of course, be in the form of a mesh so that the electrons may pass through.

In this way valves have been made having an amplification factor as high as 400, although this very high value cannot be realised in ordinary practice.

At the same time, as you know, screened-grid valves, even under practical conditions, can be made with an amplification factor many times that of the ordinary three-electrode valve, when used in an appropriate circuit.

### Action of Screen Grid.

The screen gird is, of course, given a positive potential, and may be bypassed

*(Continued on next page.)*


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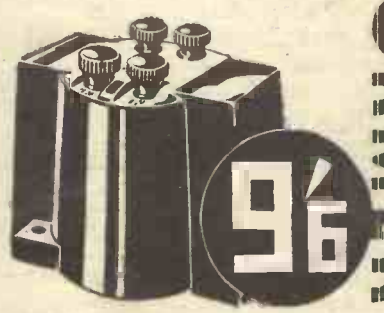


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# —SUNDAY GRAPHIC—


## TECHNICAL NOTES.

*(Continued from previous page.)*

to the filament by means of a condenser, so that H.F. currents may go to earth. There is then a capacity between the plate and the screen grid which, however, does little or no harm.

The effective capacity between the plate and the ordinary control grid (which, as I mentioned above, was the cause of the feed-back action which placed a limit to the amplification obtainable) has thus been practically overcome. This is why we are able to obtain so very much greater amplification under practical conditions with the screen-grid valve than with the ordinary three-electrode valve.

### Shielding.

As I receive many questions from readers relating to shielding, I think I can best answer them by referring very briefly to the requirement for shielding and how shielding produces the desired effect.

First of all, I should say that in practically all modern radio receiving sets shielding is used to a greater or less extent.

The purposes for which it is employed fall under two main headings, namely, those connected with the interior arrangements of the receiver itself, and those connected with the prevention of interference from external sources.

Under the first heading is the use of shielding for preventing interaction between one stage of the receiver and the next, that is, the effect of any stage upon an adjacent stage.

Under the second heading comes the shielding of the coils and the internal wiring of the set so as to prevent the direct pick-up of the signals of undesired transmitting stations.

### Preventing Interference.

I should say that the second effect is not so important as the first, and in many cases shielding of the coils and wiring of the receiver from unwanted signals is not really necessary. In most modern types of set, however, shielding as between adjacent stages is very important and the efficiency of the set (having regard to compactness and other considerations) could not be obtained without the use of shielding.

The shielding of separate stages is accomplished by thin metal sheets suitably placed or by actual metal covers enclosing the stages, small holes being, of course, provided to allow the necessary wiring and control shafts to enter and leave.

### Metal Cases.

As regards shielding the whole receiver from unwanted signals, this can be done by enclosing it completely in a metal case or by providing a metallic lining to the wooden cabinet.

Generally speaking, however, the shielding of the whole receiver is only necessary when it is to be used fairly close to a powerful transmitter, and for the present purpose we may confine our attention to the inter-stage shielding. The principle on which the shield acts is, of course, the same in any case.

The shielding is of two kinds, partly electrostatic and partly electromagnetic.

*Continued on next page.*


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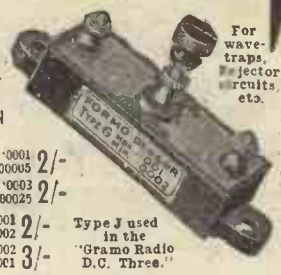

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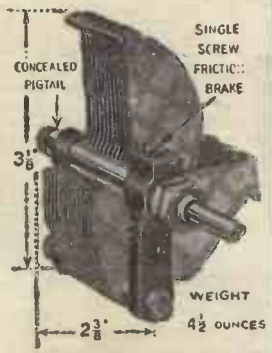

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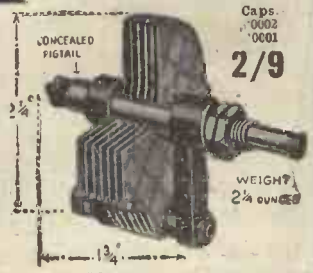

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2/9

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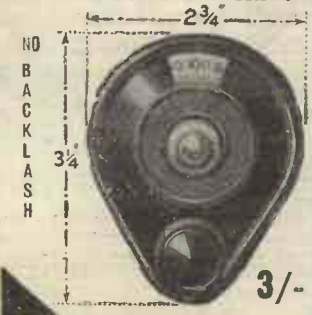

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# TECHNICAL NOTES.

*(Continued from previous page.)*

**The Electrostatic Effect.**

As an electrostatic shield, its function is to cut off the electrostatic effect of one component from another, and it does this by acting as a plate of a condenser (in a very similar way to the screen-grid in a screen-grid valve).

Inasmuch as the capacities involved are small, practically the thinnest sheet of metal is sufficient from this point of view, and it really becomes a question of mechanical strength and handling. Even fairly open wire mesh is sufficient so far as the electrostatic effect is concerned.

**The Electromagnetic Effect.**

The shielding of the stages from stray electromagnetic effects, however, is more difficult to accomplish completely and, in fact, it is never really secured with the same completeness as the electrostatic shielding.

All we can hope to do is to reduce the electromagnetic interference to a small percentage of its original value. If the electromagnetic interference consisted of a *steady* magnetic field, the shielding would become extremely difficult, since it would be necessary to use very thick plates of iron to deflect and conduct away the magnetic lines of force.

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**Eddy Currents.**

In virtue of this eddy effect, a comparatively thin sheet of any metal (not necessarily a magnetic metal) will serve the purpose of an electromagnetic shield.

The rapidly alternating electromagnetic field sets up by induction electric currents in the metal shield, and these in turn set up electromagnetic fields which tend to oppose those producing them; in other words, the eddy currents represent a dissipation of the energy of the interfering electromagnetic field, and the amount of electromagnetic energy which can pass through the field is comparatively small.

As these eddy currents are to be produced in the shield it is necessary that the shield must be of a fairly low electrical resistance—that is to say, it should be made of a highly conducting metal, such as copper or aluminium, and it must be of sufficient thickness.

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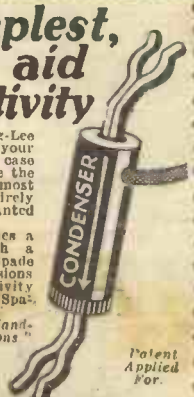


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Dubilier Paper Condensers have been positively proved to give life-long, reliable service of the highest efficiency. Under a continuous test in our factory they have outlasted 10,000 hours. That is why Dubilier Condensers are used wherever efficiency over long periods must be maintained and a breakdown would be fatal.

*Obtainable in a wide range of capacities and voltages; also in "blocks" for Battery Eliminator construction.*

*If you have any difficulty in obtaining Dubilier products write to us direct giving the name and address of your dealer.*

# DUBILIER
## PAPER CONDENSERS

*Call at your Dealers on the way home and get a copy of "A Bit about a Battery," Dubilier's Free Booklet.*

DUBILIER

*Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, N. Acton, London, W.3*

BC279/P

# ENORMOUS MAGNIFICATION ABSOLUTE STABILITY AND EXCEPTIONAL SENSITIVITY!

The Mazda A.C./S.G. will give a higher amplification than any other screened grid valve on the market—and with complete stability.

The reason is to be found in the unique duplex screen grid which, together with other exclusive features, reduces the anode/grid capacity to a remarkably low figure.

*The Amazing*

# MAZDA RADIO VALVES

**PRICE 25/-**

THE EDISON SWAN ELECTRIC CO., LTD.,
*Radio Division,*
1a, Newman Street, Oxford Street, W.1.
*Showrooms in all the Principal Towns.*

# EDISWAN

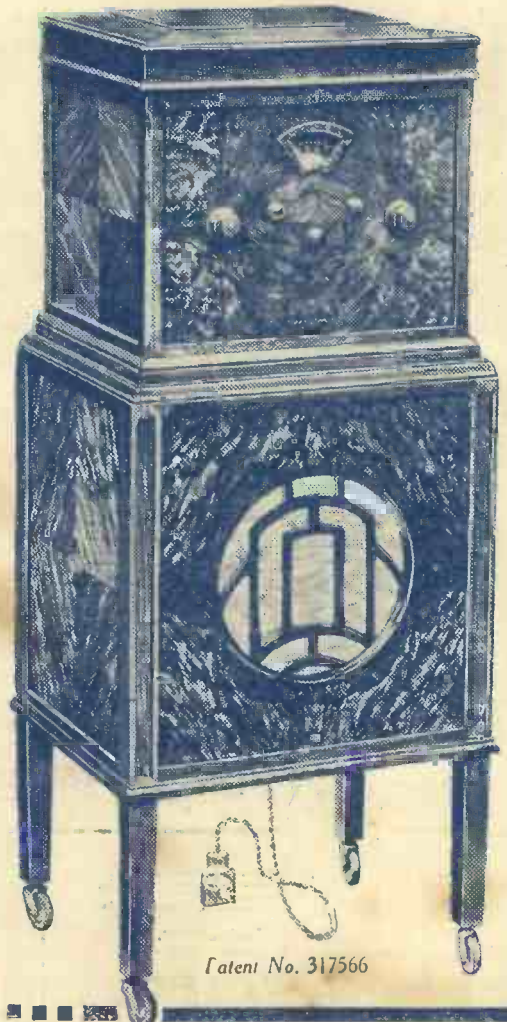
V. 37

# The New Home of the Famous

# MADRIGAL

## ALL-ELECTRIC TRANSPORTABLE SET

The success of the "Madrigal" and other R.I. products created a demand that could only be met by larger and more up-to-date factories which we will occupy in June. The new Works are built on a site of over two acres on the Great By-Pass Road, between Thornton Heath and Purley, on the London-Brighton route.



Patent No. 317566

***Greater facilities for production of the "Madrigal" now enable us to comply with the demand of those who prefer to purchase out of income.***

GENEROUS TERMS of EXTENDED PAYMENTS ARE AVAILABLE, PLACING THE "MADRIGAL" WITHIN REACH OF ALL

***"Madrigal" is the first real diversion from ordinary radio reproduction.***

If you are a music lover, and wireless reception, as you know it, jars you with its imperfections, hear the "Madrigal"; you will be amazed at its complete mastery of all notes and sound.

If you are a reader of wireless journals, you will know that the "Madrigal" has received *more favourable comments than any other transportable electric set. This is justified by the wonderful circuit performance and the amazing quality of tone from its moving-coil speaker.*

**NO AERIAL OR EARTH IS NECESSARY** for local reception, and it is *transportable anywhere* in the home where an electric light or power socket is available—it is ideal for summer use in the garden.

***Ask for full particulars and a copy of the "Madrigal" booklet reproduced in full natural colours. Also let us arrange a demonstration in your home, through your local dealer.***

*The "Madrigal" All-Mains Receiver only, in walnut or mahogany, handsomely figured and polished.*
*Price, including all valves and royalties, for A.C. or D.C. mains* **£30:0:0**
*or deposit £4, and 12 monthly payments of £2:10:0*

*"Madrigal" All-Mains Receiver and Coil-driven loud speaker, complete, in walnut or mahogany. For D.C. Mains* **£45:15:0**
*or deposit £6:5:0 and 12 monthly payments of £3:15:0*

*"Madrigal" All-Mains Receiver and coil-driven loud speaker, complete, in walnut or mahogany. For A.C. Mains* **£48:18:0**
*or deposit £7:4:0 and 12 monthly payments of £4:1:6*

R.I., LTD., 12, HYDE STREET, LONDON W.C.1.

Printed and published every Thursday by the Proprietors, The Amalgamated Press, Ltd., The Fleetway House, Farringdon Street, London, E.C.4 Advertisement Offices: Messrs. John H. Lile, Ltd., Ludgate Circus, London, E.C.4 (Telephone: City 7261). Registered as a newspaper for transmission by Canadian Magazine Post. Subscription Rates: Inland and Abroad, 17/4 per annum; 8/8 for six months. Abroad (except Canada), 19/6 per annum; 9/9 for six months. Sole Agents for South Africa: Central News Agency, Ltd. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd. Saturday, May 24th, 1930 88

**BROADCASTING THE DERBY** (See Page 311)

# Popular Wireless

Every Thursday PRICE 3d.

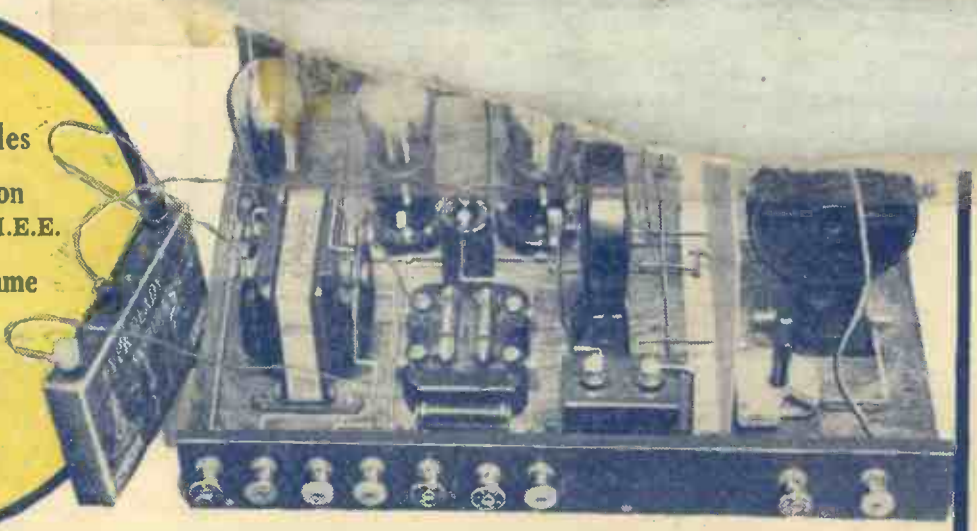
No. 417. Vol. XVII. INCORPORATING "WIRELESS" May 31st, 1930.

## Build "THE NEUTYPE" FOUR

*See Inside*

*Contents*

Transformer Troubles
Quality Reproduction
By Capt. P. P. Eckersley, M.I.E.E.
Your Alternative Programme
In Paris With a Portable
Revising The Charter
etc., etc., etc.



PORTRAIT OF A GENTLEMAN BEING SHOCKED!

# A SHOCKING CASE

## Read This

*"To The London Electric Wire Company and Smiths Limited.*

*"Dear Sirs,*

*"I feel it my duty to write and let you know of the wonderful results obtained while using your Coils. I built the "Magic Three" about a month ago, but I got a shock to find I could only get weak signals from far stations (using cheap 'X' Coils). Last week I was advised to try Lewcos Coils. On doing so I got another shock, for the stations tumbled in one after another as loud as if I had added another valve. I have had my friends in to listen to my set and they are all scrapping their old coils and going in for Lewcos. Some time next week I will buy the 100 and 250X for the long waves, and you can bet they will also be Lewcos, because I will never use another make. You can use this letter however you like so that other people may get the same joy out of wireless as I am now getting, thanks to Lewcos Coils."*

The name and address of writer will be supplied on request.

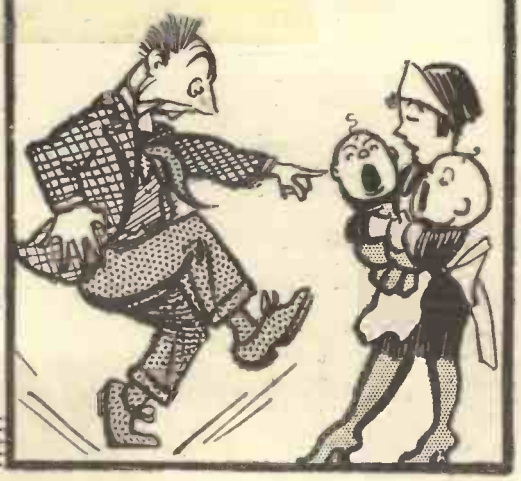
The LEWCOS "X" COIL

**The above eulogy of the Lewcos "X" Coil is yet another proof of its magnificent performance.**

**This Lewcos component will enable your Set to clarify reception to a wondrous degree and it is famous amongst experts and amateurs alike for its capacity to separate music from adverse atmospheric conditions.**

**LEWCOS "X" and CENTRE TAPPED COILS are specified for the "NEU-TYPE FOUR" RECEIVER.**

SAME GENTLEMAN BEING SHOCKED AGAIN !!!



LEWCOS

RADIO PRODUCTS FOR BETTER RECEPTION

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED
CHURCH ROAD, LEYTON, LONDON, E.10.

*Trade Counter:*
7, PLAYHOUSE YARD, GOLDEN LANE, E.C.1

# Popular Wireless

Scientific Adviser:
Sir OLIVER LODGE, F.R.S.
Chief Radio Consultant:
CAPT. P. P. ECKERSLEY, M.I.E.E.
Editor: NORMAN EDWARDS.
Technical Editor: G. V. DOWDING, Associate I.E.E.
Assistant Technical Editors: K. D. ROGERS,
P. R. BIRD, G. P. KENDALL, B.Sc.,
A. JOHNSON RANDALL.


**BUILDING DOWNWARDS?**
**RELATIVELY SPEAKING.**
**A NAVAL MENACE?**
**MORE BIRDS!**

**CHANGING ENGLISH.**
**"EXPERTS" ABROAD.**
**LEARNING MORSE.**
**HANDSOMELY SPOKEN.**

## RADIO NOTES & NEWS

### An Impending Tragedy.

THE occupier of one of the lath-plaster-and-roughcast villas which have sprung up overnight nearby, has slung his aerial to a poplar—too high up. The result is that when a fairly stormy wind whips the tree about like a fishing-rod, the wire alternately tautens and becomes slack. There is not enough sag in the wire to prevent any possibility of a climax, and I know that it is simply a question as to which is the stronger, the wire or the house. This afternoon the house seemed to me to rock slightly on its base! My money is on the poplar!

### Anti-Broadcasting Movement.

THE movement against the re-broadcasting of music, etc., by privately owned loud speakers is growing rapidly. Civilisation and its frayed nerves are fighting against the noise which is the fruit of "progress." Scarcely a week passes without the institution of a by-law prohibiting the public performance of loud speakers and Scotland Yard is beginning to revise some of its unsolved murder cases in the hope of finding that the victims used five valves too generously. New York, the noisiest city I know, has had to take the evil in hand very firmly. In Texas, however, dried pieces of re-broadcasters blow about the streets—a common sight!

### Progress of Telephony.

THE Post Office, doubtless as a result of the recent little bicker in the "House," is developing its international radio-telephone service rapidly, though the quality of the recently-opened service with Australia must be judged over a period of at least one year. However, a start has to be made and the P.O. is to be congratulated, though in spite of its disclaimers it certainly appears to be flirting with American communication interests, which all the world now knows are "out to lick" British cable supremacy into a pale pink jelly.

### "Yes, We Have No——"

*Yes, we have atmospherics,*
*We have atmospherics to-day.*
*We've induction, reaction,*
*Cat's whiskers and crystals,*
*Dull emitter tubes also and say*
*We have anti-phonics and filaments,*
*Grid leaks and switches, and say;*
*But yes, we have atmospherics,*
*We have atmospherics to-day.*

—"*Argonaut*" (*U.S.A.*)

### "No News."

I DOUBT whether the B.B.C. will ever completely live down its mirth-provoking Good Friday announcement that there was "absolutely no news." In journalistic circles, at least, the joke will be a perennial, and will be told to "cub" reporters by wheezy old door-porters when we are ancient beavers. The thought or belief that the human family can go on being human for a single hour without something happening—even on a Good Friday—is stupendously stupid, but perhaps the difference between "no news" and a B.B.C. News Bulletin is not so very striking after all.

### CARDS FROM ALL CONTINENTS.

Mr. Crowe, of Kensington, has a colossal collection of Q.S.L. cards culled from all countries. He is in constant communication with keenly critical collaborators, and his clear "keying" can be caught in all climes when conditions are kind.

### Building Downwards?

EVERY time I pass along the Embankment I observe with interest the site of the proposed new headquarters of the great cable and wireless merger. There is a fine large hole and little else: no building—unless they are building downwards in an attempt to increase the available accommodation. They say that this hole is going to be a world-beater and will make the hole the B.B.C. dug for Broadcasting House look like a rabbit burrow. It is rumoured that the excavators have delved down so far into Roman London that the men come up with Black Shirts, and salute each other by "raising their elbows"!

### Barrage—New Style.

THE nearest approach to a real war in the ether is the contest between the Russian and Roumanian Governments. It appears that the Soviet has been pumping out anti-Roumanian propaganda by means of radio. In order to counteract this the Roumanian Government has decided to "jam" the Russian station by means of a special interfering transmitter working on 938 metres. Real warfare apart, I have never known another case of deliberate, authorised "jamming." But the affair is deplorable, and slightly ridiculous and certainly undignified. There ought to be a Radio League of Nations to intervene and stop this neighbours' argument.

### Relatively Speaking.

THE recent announcement to the effect that someone has discovered an ether wave with a velocity greater than that of light has excited the Einsteinians, who are making all sorts of dreadful deductions from the notion. But the best of them, culled from "The Radiogram," is as follows:

*There was a young lady named Bright*
*Whose speed was faster than light.*
*She eloped one fine day,*
*In a Relative way—*
*And returned home the previous night!*

### Menace to Navies.

SHORT-WAVE transmission appears to be a potential navy reducer, judging from the findings of the U.S. Navy Department's Bureau of Engineering. It is reported that the investigators discovered that they could light a 24-volt lamp by

(*Continued on next page.*)

# NOTES AND NEWS.

*(Continued from previous page.)*

connecting it between the breech of a turret gun and the turret, and explode the primer in the breech with the current. As a result the naval authorities have prohibited the use of frequencies higher than 4,000 k.c. during target practice or refuelling. Why didn't the primer explode before? Or why not prohibit, instead, the connection of guns with turrets?

### More Birds?

A STEYNING reader reports having heard Kattowice using a "bird" interval call, though not such a melodious squawker as Turin's, which, by the way, he says has been heard less frequently of late. Does anyone confirm this, and what kind of bird is it? Our correspondent uses the "Magic" Three and has a "bag" of well over thirty stations, L.S. reception, medium waves. There is a wide scope for ingenuity in selecting distinctive and beautiful identification calls. Why don't some of the other stations enter the contest?

### Interference Problems.

E. A. P. (Margate), who has our sympathy, complains of the interference caused by a refrigerating plant owned by a local butcher. The B.B.C. said, in effect, "Sorry, but there is no legal remedy." The butcher said that the refrigerator was necessary to his business whereby he earns his livelihood. All very sad, but why did not the B.B.C. try to suggest to the butcher some simple means of preventing the interference? An appeal to that citizen's sense of fair play, plus some willingness on the part of E. A. P. to share the expense—which I am sure he has—and the matter might be mended. Even now it is not hopeless, and I suggest that the help of the Post Office be sought. The butcher *must* refrigerate—but if interference with his neighbours *can* be prevented it is hard to believe that he would finally decline to do that.

### World-Wide Radio News.

UP comes A. W. M. (Middlesbrough) again with one of his useful budgets full of gleanings from all over the world. I never knew anyone who gets so much fun as he out of long-distance short-wave searching. Nothing is secret from him, apparently, except the identity of a station, 3 R O, which tests telephony on 25 metres on Wednesdays at 10.30 a.m. and noon. Can anyone help? I am passing his letter to W.L.S. for analysis. Meantime—thanks! And may your example inspire many others to explore the world as efficiently.

### Changing English.

A SAD story from E. B. C. (Alberta) about the Americanisation of the English language which is being encouraged by Canadian radio "announcers!" For instances, consider that "schedule" is "skedul;" "speciality" becomes "specialty;" "half," "hef;" "valve," "toob"; "tune," "toon." Further, the Canadian newspapers adopt the U.S.A. methods of spelling (labor, color, sox, etc.). E. B. C. says that, far from being indirect, American radio publicity is very much to the point, and he cites an example, wherein, after "Annie Laurie," there was an undertaker's announcement about cremation!

### The Expert Abroad.

IT is amusing to note that although the Canadian towns abound with advertisements of Correspondence Schools which will turn people into "expert radiotricians" for £20, the "expert" of the newspaper is no whit behind our own Sunday paper variety. Note that "201 A tubes take a current of 6 volts," and that if you are troubled with "inherent cracklings" you are advised to "wire a 2-mfd. fixed condenser *in series* with your 'B' battery!" Why not connect a common hairpin *in parallel* with the L-speaker terminals? So much cheaper!

### Violent Contrasts.

A SEA skipper has patented a device by means of which the name and position of a ship, with the distress signal, can be sent from a wireless transmitter merely by pressing a button. The invention is intended for use especially on vessels which ply in Chinese rivers and seas where piracy is rife. Very useful, I dare say, but from all I know of the gentle Chink pirate I gather that before help could be obtained all would be over except deck-swabbing! But what a contrast! Piracy on the high seas in the days of the *Elettra!*

## SHORT WAVES.

BIRD NOTE. Cuckoos have been late this year. They have been hanging back on the chance of securing broadcasting engagements.—"Sunday Express."

* * *

If your wireless set will not separate Brookmans Park and Daventry, rattle your little boy's money-box.

You will soon hear Aberdeen calling.—"Mullard Magazine."

* * *

"Wireless sets are to be provided in lonely lighthouses," we read in the "Bulletin and Scots Pictorial."

So that when they switch off they will at least be able to appreciate the silence of solitude.

* * *

NEVER OPPORTUNITIED.

Speaking of an American radio actress who, at eighteen, has just found "an opportunity to release her delightful scream," an American journalist remarks: "She has never emoted behind the footlights."

The reason is, probably, that she was never opportunitied to do so.—"Wireless Weekly."

* * *

THE WIRELESS AWAKENING.

Now the wireless "fan" in the Fatherland
Is listening-in to a German band
Each morning while in bed;
Or switched on at night—if his juice will last—
He's roused in the morn with a trumpet blast
That would almost wake the dead.
But in "wireless" our country's well in front,
And I'm sure we can beat this German stunt;
So we'll ask the B.B.C.,
Should they start in the morning to rouse us up;
If they kindly will broadcast a breakfast-cup
Of new-made wireless tea.

"News of the World."

### News of "Economy" Three.

C.R.E.S. (Elstree), who is a "P.W." "Number Oner," claims to have improved the "Economy" Three by means of the following modifications. Three H.T. tappings; a 25,000 ohms wire resistance between Tap No. 1 and R.C. unit; output filter for L.S. Instead of connecting grid leak to L.T. (pos.) he fits a potentiometer across the L.T. and connects the grid leak thereto. He has also incorporated the Brookmans Park Rejector, and says that although he is only 5 miles from the Twins he can cut out either at will.

### Learning Morse.

AS to whether the elbow or arm should rest on the table whilst the Morse Key is being operated, there is some difference of opinion amongst telegraphists. In fact, J.A.L. (Cawood) says that thereby the "touch" would be cramped. I think that it is largely a matter of personal characteristics, though no doubt there is, theoretically, a "best way." Some people "send" with the whole forearm, others mostly with the wrist, and I have seen Americans send very rapidly, with the forearm flat on the desk, only the hand appearing to move; a "light" key and a very small gap, of course. Generally speaking, the smaller the gap the less the fatigue.

### Handsomely Spoken.

WHEN an American pays a compliment he goes "all out" and scorns to spoil the effect by introducing the slightest sound of "faint praise." Hence Dr. R. A. Millikan, a well-known scientist who trifles with electrons as easily as a boy with marbles, in writing of British broadcasting does not play the niggard in his praise. He says, "the programme that is on the air in England is incomparably superior to anything to be heard here——" He adds that the reproduction here is as fine as in America. In return for that, Sir, we salute every separate star and stripe.

### "P.W."-ites to the Rescue.

WE are delighted to learn from W. A, (Rushden) how heartily our readers rallied to his aid as a result of the "S.O.S." we published. He received replies from Surrey, Bucks, Bristol, Doncaster, Leeds, London, Dublin, Edinburgh, S. Wales, and Malta (from one of H.M. Ships), altogether about forty letters, besides callers with copies of "P.W." in their pockets. Nine acknowledgements have been sent by W. A., and he and we offer all who helped him the most cordial thanks. What a kindly old world it is after all!

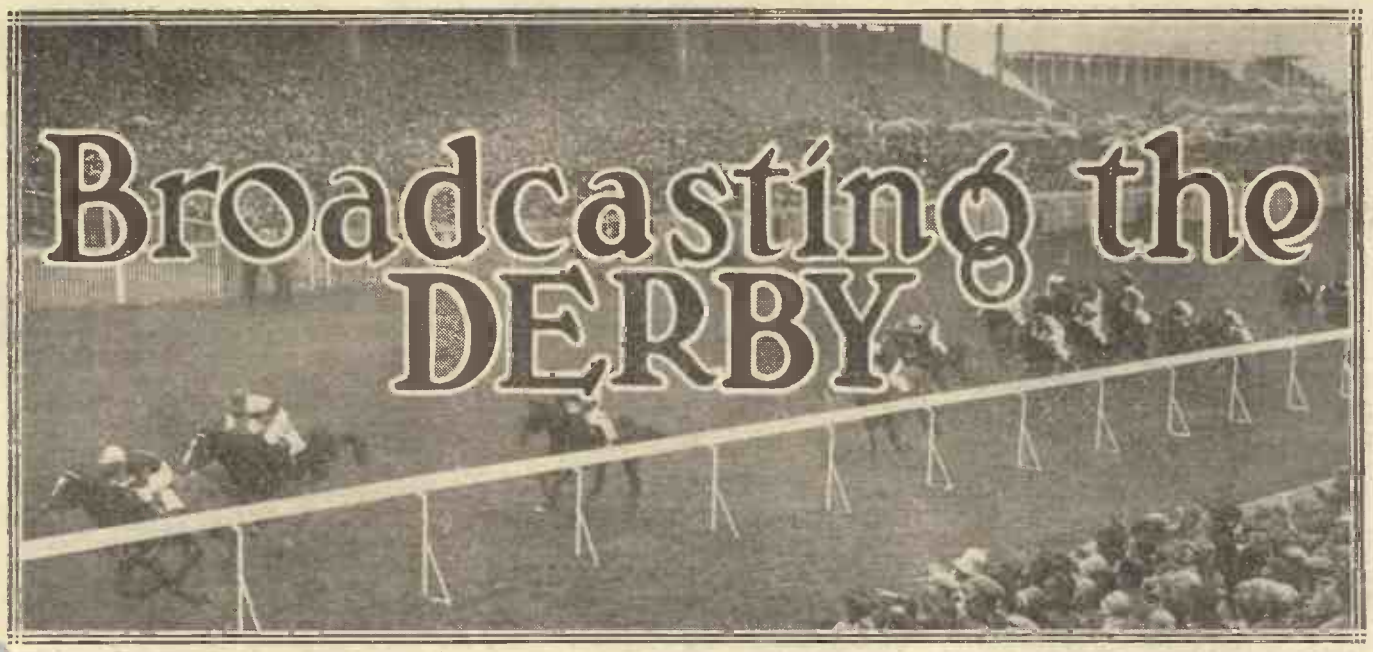
### "Thinking Big."

IT was recently reported that a lady, on being asked by her prospective bridegroom what she would like for a wedding gift, replied that she desired him to give every blind person in the county a wireless set. The gentleman consented, doubtless without even the slightest tremor of his frame. I do not know whether Gloucestershire is unduly afflicted, but the sum of £10,000 has been mentioned as being required for the execution of the lady's good pleasure. Let us hope that the majority of blind people in the whole country are already provided for.

### New Type of Battery.

AN observant reader has sent me a clipping of an advertisement extolling the merits of a portable set. The set's name, "Miracle," is apt, if somewhat exaggerated, considering that the ad. alleges it to be fitted with "turntable battery." Is this battery one of those which reverses its polarity, or turns white?

ARIEL.



# Broadcasting the DERBY

**"They're off!" Then from the loudspeaker follows an excited description of the world's most famous race. How is this broadcast carried out? Read the following article and learn about the tremendous preparations necessary for the short but thrilling commentary of the two or three minutes' race.**

**By OUR SPECIAL CORRESPONDENT.**

WITHIN the past two or three years, the B.B.C. has effected so many "outside" broadcasts of sporting events, it would be hardly possible to select any special one as being the most popular. The Cup Final, the Boat Race, Rugby internationals, athletic meetings, the Wimbledon tennis meeting, the Grand National—they all have their followers.

But if it were possible to take a census of *general* public opinion as to the best sporting broadcast in the course of a year, I would wager that the Derby would top the list. I base my opinion on the fact that, whereas the ordinary branches of sport attract only a certain section of the public, the Derby has a glamour and fascination of its own which makes its appeal world-wide.

### Matter of Seconds.

Consequently, your Rugby man, your Soccer fiend, your tennis enthusiast, and your rowing expert, even though they may have no interest in horse racing as a sport, all are drawn towards the Epsom classic.

Again, we may or may not bet, but who amongst us is disinterested in the result when those many months of press publicity culminate in a wonderful two minutes of breathless racing?

Before I proceed to a description of the arrangements which enable British listeners to follow the course of the race from start to finish, there is one point worth mentioning. The commentary proper of the Derby is a matter of seconds.

Moreover, the race in no way lends itself to a colourful description. There are no spills or jumps, no breathless recoveries to record over a period of a quarter of an hour, such as we get in the Grand National.

### Three Microphones.

On this account, the B.B.C. authorities are apt to regard the latter race as a much more picturesque broadcast than the Derby. It is for you, reader, to decide whether you prefer two minutes of Epsom thrills or fifteen of Aintree falls.

The engineers concerned with the relays consider the Epsom broadcast one of the simplest tasks they are called on to undertake. Throughout the whole entertainment, there is only one commentator, a vastly different state of affairs from Aintree, where there are two speakers (one in the stand and one in the "country"), who take up the description in turn as the horses round the course.

At Epsom, three microphones are used. Two of these are for the commentator, while the third is intended to catch the noises in the Ring, and thus convey to listeners something of the racecourse atmosphere.

The commentator's position is a small railed-off point on the extreme left (facing the course) of the Press Gallery in the Grand Stand. Some ten feet behind are the amplifiers which, of course, are in the hands of the engineers. When the speaker's voice has been suitably adjusted, it is conveyed by a double line to London by way of the Epsom Telephone Exchange.

One of the difficulties which confronts the B.B.C. in making this broadcast is that the constant moving and shuffling of the gentlemen of the press in making telephone calls and similar errands is apt to prove disturbing to both commentator and listeners, occurring, as it does, within a few feet of the microphone.

## WATCHING THE RACE

The commentators in the special box of the Press section of the Grand Stand at Epsom, watching the start on the further side of the course.

### Reflected Echo.

There is, too, a reflected echo from the covered stand which tends to accentuate the difficulty. But the problem has been overcome in the simplest manner possible by the use of a thick carpet which effectively muffles the tread of footsteps in the immediate neighbourhood of the "mike."

From the brief outline I have given, it will be readily understood that no elaborate arrangements are necessitated for the Derby broadcast.

Those who heard the performance of 1927 will remember that we were given the shouting of touts and tipsters, the bookmakers' cries, the weighing in, and the noises of the enclosure. Personally, I did not regard these incidentals as very bright entertainment, and much prefer the straightforward broadcast we are now given.

Incidentally, there is an amusing story to be told of

(*Continued on page* 332.)

# REVISING THE CHARTER.

## THE NEW CHAIRMAN'S OPPORTUNITY.

By THE EDITOR.

THE Prime Minister was asked in the House of Commons the other day whether he would inquire into the charter of the B.B.C. with a view to its revision so as to make the Postmaster-General responsible for certain aspects of the policy of the B.B.C.

For example, the treatment and remuneration of the officials of the Corporation, and effective criticisms of programmes, their quality, suitability, and sums paid for rights of reproduction.

For some time past now there has been a steadily growing body of public opinion which holds the view that the present charter of the B.B.C. is too rigid; it leaves no loophole for certain policies connected with the conduct of the B.B.C. to be properly and effectively criticised.

Programmes, for instance, cannot be controlled effectively in the House. Under the present charter the B.B.C. is quite immune from the criticisms of members of parliament, and not until the charter expires, or is revised, can the present state of affairs be remedied.

### Autocratic Powers.

The Charter does, undoubtedly, give the B.B.C. in quite considerable degree, autocratic powers; and even the P.M.G. cannot exercise so much influence over the B.B.C. as some people imagine.

The Prime Minister, in his reply, said he did not think it advisable to revise the charter in the sense indicated, and when asked what steps can be taken by those B.B.C. officials who feel themselves aggrieved owing to dismissal, the Prime Minister replied that the question should be written down, in which case he might consider it.

Another member asked whether the Prime Minister was aware that the present restrictions on Sunday broadcasts are causing considerable dissatisfaction, and was that not a reason for giving an appeal from the B.B.C.

Mr. MacDonald, in reply, said he had not got the provisions of the charter at his finger-tips. The charter was granted in 1927 for ten years, and on that basic fact he had given his reply.

## JAPAN'S PRIME MINISTER

Mr. Hamaguschi, who is Prime Minister of Japan, broadcasting a message to the people after his re-appointment.

Nevertheless, listeners should note that at last the matter of the B.B.C.'s charter has gained sufficient prominence to warrant questions about it in the House. It is unlikely that the matter will be allowed to sink into oblivion, and in view of the interest—still unsatisfied at the time of writing — concerning Lord Clarendon's successor, it is more than likely that the B.B.C. and its charter will be discussed again in the House before very long.

The delay in deciding upon Lord Clarendon's successor has already been the subject of a good deal of comment and, incidentally, a good deal of uneasiness.

The appointment is a very important one. Indeed, with the possible exception of the Home Secretary, there seems no other public post in this country which entails so much responsibility.

### Lord Clarendon's Successor.

Broadcasting is no longer a novelty. It has taken its place as a serious and indispensable public service system, and the man who is head of the Board of Governors carries a very great responsibility.

So many names have now been mentioned as likely successors to Lord Clarendon that the task of "spotting the winner" is almost as difficult as "spotting" the winner of the Derby. Lord Lee, Lord Gainford, Lord D'Abernon, Lord Lloyd, Mrs. Snowden, Mr. Geoffrey Dawson (Editor of the Times), and others, have all been cited as likely candidates.

And it has even been said that Sir John Reith, is in the running for the dual post of Chairman and Director-General.

Why the Prime Minister has delayed in publicly announcing the appointment for so long is something of a mystery. Rumour has it that the appointment has been offered to two or three distinguished people, but the offer has been declined.

### The Man We Want.

Still, who ever takes the job of Chairman of the Governors of the B.B.C. will have to be a "strong man." The job is not purely ornamental. Definite qualities of a high order are essential, plus a highly-developed sense of diplomacy.

We do not envy any one the position, but we sincerely hope the appointment will be made soon, and given to a man with a mind and a will of his own: a man who will, perhaps, in some ways, balance the faults of the Charter with the virtues of lofty aspirations for the public good, and a strict sense of the responsibility of being head of the governors of an organisation which, to-day, serves fifteen million listeners in this country alone.

# WIRELESS AND THUNDERSTORMS

By JOSEPH H. ELGIE.

LISTENERS-IN will be glad to know that there is every prospect of the coming summer being much freer from heavy thunderstorms than the past few summers have been.

These electrical disturbances are to a certain extent connected with disturbances on the sun which reveal themselves in the telescope either as sunspots or immense clouds of luminous gas.

### Effect of Sunspots.

The sunspots are known to be vast whirling masses of electrified matter, and it is therefore easy to understand how, by discharging streams of electrons towards the earth, they frequently affect our atmosphere to such an extent as to bring about more or less violent electrical storms.

There are regular recurring periods of about every eleven years when the sunspots reach their maximum both as regards size and number.

One of these maximum periods has now just passed; the face of the sun has become very much freer from large spots, and even the smaller ones are noticeably fewer in number.

The effect of this will, no doubt, have been observed by listeners-in this season, in the comparative freedom from that type of thunderstorm which especially proves so alarming to the inexpert, and therefore nervous owner of a wireless set.

Generally speaking, there is little doubt that during periods of maximum sun-disturbance the listener-in experiences a great deal more trouble with "atmospherics" than when the sun is quieter.

"Atmospherics," of course, can be caused by thunderstorms hundreds of miles from the user of the affected wireless set.

While a very conspicuous spot, many times the size of the earth, may pass without any effect whatever on the atmosphere, a quite insignificant one is capable of causing no end of trouble to the listener-in, who naturally wonders whence the irritating interference comes.

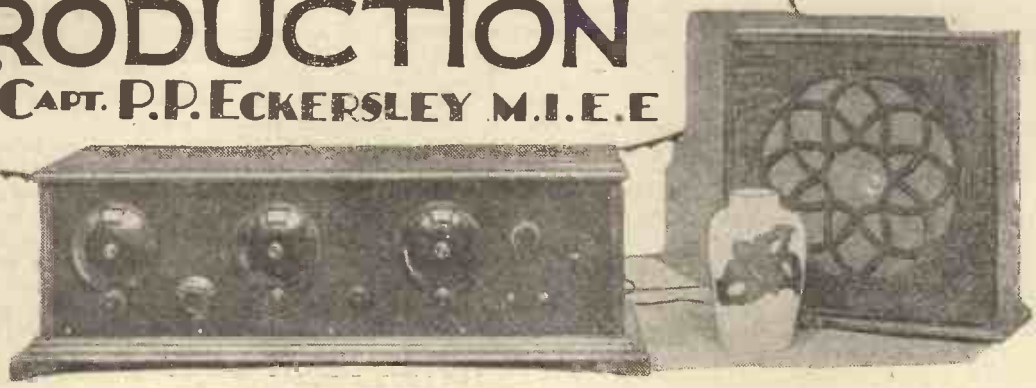
### A Curious Anomaly.

There was an instance of this curious anomaly (so far as concerned magnetic storms) a year or two ago, when a spot appeared which, so to speak, I scarcely looked at twice with my telescope, but which caused quite a violent magnetic storm, whilst a large spot not long before had failed to affect the earth's magnetism in the least.

It will be a relief to the listener-in, therefore, to know that even these *small but potentially troublesome* sunspots are gradually becoming fewer and fewer as the thunderstorm season approaches.

# QUALITY REPRODUCTION

## By Capt. P. P. Eckersley M.I.E.E



I HAVE been thinking a lot about this eternal question of quality. There are so many things bound up in it all. The ultimate result must have its criteria before we start on details. And the ultimate result need not be reality, as I have so often said.

The ultimate result must be sufficient in itself to give some impression to stimulate thought and imagination to please as sound and/or to remind us of something we have had pleasure in experiencing.

**The Programme-Maker's Job.**

To stimulate thought and imagination is the programme maker's job, but he must, to be successful, know something of the technical side. I have seen with growing apprehension the divorcement between the technical and programme side of the B.B.C.; there is an even worse contact between technicians and programme makers in Germany. Mr. Filson Young has always had this difficulty in mind, and has eagerly sought to try and bring the two parties together.

His view, and mine, is that no producer can ever be successful unless he knows the capabilities of the medium. In cinema production the successful people know at least what the medium will do.

The producer may see a lovely view on a lovely day and be filled with the emotion of refreshing spring, things growing, and the wind whispering among frail new leaves; the producer knows that to convey this by "pictures" means more than photography by swinging the camera round and round of just what he sees.

**Sound Contrasts.**

He must visualise the conditions of reproduction, the stuffy picture-house, the flat screen. But he may convey this atmosphere by giving us the flash of a lover's arm and a nodding daffodil, far better than with the most accurate photography of the wide champagne he feels with *all* his senses.

He must know that a lens distorts, that far-away mountains will not reproduce, that reproduction lacks true colour (especially with colour photography) and so on.

In broadcasting the producer must know that the explosion of a liner in mid-ocean is a no more terrific noise to the listener than when the speaker inadvertently brushes the microphone with his papers; that contrasts in sound are necessarily limited in the range from weak to strong; that it's all very musical to get the pianissimo passage so soft that, alone in a silent room with headphones, you can just hear it, but what of those at the end of 500 miles of land-line?

**Our Radio Consultant-in-Chief pleads for more "atmosphere" in broadcasting and for a closer co-operation between programme and technical experts. Further, he suggests that Announcers should be forbidden to go too near to the microphone, that reverberation should be more scientifically controlled, and—but you must read his exceptionally interesting article.**

He must know, too, when announcing, that life and character, which can be conveyed in the "sound" background are essential aids to artistry. Too often the listener's loud speaker is set too loud because, in a large room, it has to be to reproduce all that is going on in the studio. Actually, it reproduces what is born as soft and intimate, too loud and so too flat and boomy. The proper volume of the original soft intimacy could be natural but too weak to hear.

**The Receivers' Task.**

In opera, musical comedy, and such-like, where dialogue follows music, one frequently notices a too great intimacy on the part of speakers—the spoken word should be bolder, clearer, and with more "atmosphere" around it.

But the receiver must play a part in interpreting the wishes of the producer. I am amazed in this year of grace that no commercial receiver has a *remote* volume control. I could not be without one.

Lazy listening is enjoyable listening, and I listen, one arm draped over my chair's arm, ready to dim that speaker, raise that music, and do as I will to get the true effect. You cannot have "the news" at the same volume as a symphony, and when the official interrupter comes along I refuse to bounce out of my chair, rush at the set, twiddle, sit down again, and then find the music has started again, when I have to "rise and go again."

**Remote Control.**

A remote volume control means other advantages. I can switch off when I dislike something, or keep it so dim it does not interfere with talk or reading, and then switch on directly something interesting comes along. One does not want a remote volume control with a gramophone record because the record itself has its true light and shade (or ought to). Besides, with gramophones one has to be getting up and down every few minutes, anyhow.

So here we are with a remote volume control and the B.B.C. at

(*Continued on next page*)

## THE NEW STUDIOS.

"Ought Broadcasting House to have a very few big studios with some small ones for 'intime' broadcasting?" asks Capt. Eckersley, and he gives reasons why this question should be very seriously considered.

## QUALITY REPRODUCTION.

*(Continued from previous page.)*

the other end. I suggest that the producer uses his medium better as he understands its limitations (which are its potentialities) and as the true necessity, sometimes paramount, for the listener's volume control becomes less.

Thus. I suggest that all announcers should be forbidden to go nearer the microphone than 6 ft.. and should raise their voices to such an extent that they overcome microphone hiss. And I do not mean they should shout. I suggest that no one giving certain types of talks should be allowed to be too intimate.

### A Sense of Space.

Nearly all the B.B.C. speakers are accustomed to speaking in considerable-sized halls and it should rarely be a hardship for them to raise their voices only to that pitch that they would use when talking to a roomful of people. In informal debates it's rather different. and we at our end must use our volume controls and gather round the loud speaker much as we should gather round the actual speaker.

But what a joy it is to hear a relay from a big hall where the speaker raises his voice, flings out his words; what an extra stimulus to interest seems to come that way.

The speaker in a big hall has reverberation to help him, and I want to see some way in which everyone could be backgrounded with a sense of space. This dead studio complex has been with us too long. Of course, it does depend upon the item. As I said before, an intimate informal debate would be lost in its echo !

But news is " national news," it should go with a swing, even the weather deserves some sense of grandeur behind it Reverberation, then, must be under control, and used as a producer uses scenery, certain items being greatly helped in presentation by reverberations, others requiring a more intimate background, some requiring clear-cut deadness, others the acoustics of an ordinary room.

### A Very Difficult Problem.

Here we come to a very difficult problem. The B.B.C. have met it to a greater extent than any other broadcasting organisation I know, but they do not use the facility their technicians have devised. The B.B.C. use an echo room. Captains Round and West were responsible for the idea, which is a very good expedient, but I doubt so sound as to constitute a permanency.

The echo room is a small, hard-walled, hard-ceilinged, uncarpeted room which contains a loud speaker. This loud speaker repeats the studio sounds. Opposite the loud speaker is a microphone. The microphone picks up, then, the original sound plus much reverberation. The disturbances from this microphone can be injected by the turning of a handle, in any ratio, into the circuit coming *direct* from the studio microphone.

But the worst of it is that the reverberation component has the acoustics of a bathroom, and is a poor substitute for the real thing. I believe this technique to be, therefore, unsound, and regret it is being perpetuated in Broadcasting House. although I must say it is difficult to see what to put in its place.

But space in Broadcasting House (if there is any left) should perhaps be devoted to a few large studios and a few small ones—not many small ones. By this means the items could be backgrounded with a fuller sense of space, and I am sure the result, plus our own manipulation of volume control, would be nearer the ideal.

I notice that the Diversions programme is introduced with a technique which attempts what I suggest.

I admire the idea. Someone has said, " Now this is going to be a new and better thing, let's give it a send-off, let's copy cinema technique, even at the risk of being thought grandiloquent." But, and I fear through not understanding the technical side, all that has happened is that the announcer shouts at the top of his voice in a small, dead room. The result is just exactly wrong.

## A NOVEL RELAY LINE.

At a recent " outside " broadcast in Germany an ordinary street fire alarm was employed for connecting up the microphone which you can see mounted on its special tripod.

### " Bathroom Acoustics."

But let us encourage the idea (*any* new idea) and ask the inspirer of the O.B. department to have a talk with technicians and a listen at a loud speaker while experiments are made. I've got a " bug " in my hat, and its reverberation—reverberation does lend a bigness, give an atmosphere, and it does more—but of that anon.

All my suggestions come to this. Let us have better " atmosphere " behind items, and let this come by the programme people studying the technical side a bit more. They must not continue in that beautiful path which says that everything reproduced is the same as produced.

I have shown by concrete examples that they have a new variable to play with in reverberation, but that this, may be, will have to be done by better methods than injecting bathroom acoustics all unknown to and unheard by the artist into the direct dead broadcast.

In a previous article I wrote of the importance of distance, and this is yet another weapon to give that so much wanted variety of presentation.

### Close Thinking Required.

As to the sound itself, one comes nearer technical things. Anything harsh is horrid. A peaky wave form runs us into grid current without satisfying volume. That " too close to the microphone " feeling is frequently manifest, but it can be largely eliminated by reverberation. Thus is the studio policy any good at all ?

Ought Broadcasting House to have a *very* few big studios (with, of course, some small for the " intime " broadcasting), and for the rest might not the authorities hire large halls ? It's very expensive, but I do say that reverberation, properly used and varied, has not been given a fair chance as yet.

Look how much better O.B.'s are when we get large halls ; look how much better some gramophone records can be if they record an orchestra in a big hall ; look how much more convincing it is to relay a speech from an outside hall. To my mind some close thinking is required on this subject.

## SOME USEFUL HINTS.

**When an aerial must of necessity be supported against a wall it should not be stapled to this, but should be fixed on " stand-off " insulators, so that there is plenty of air spacing between the wire and the wall.**

* * *

**Very often a slight roughness in reproduction can be cured by the simple expedient of connecting a grid leak across the secondary terminal of the L.F. transformer.**

* * *

**Never use twisted flex for taking aerial and earth leads away from the set, for the aerial should be kept as far away from the earth wire as possible.**

* * *

**A great many people fit expensive selectivity arrangements to their sets, or interfere with the internal wiring, etc., when the simplest way to obtain the selectivity they desire would be to use a " P.W." " Brookmans " Rejector.**

* * *

**Often when results from a set fall off after a year or two's use it is not the set which is " wearing out," but simply the valves which are losing emission.**

* * *

**Unlike howls due to too much reaction, etc., the low-frequency howl is distinguished by the fact that it does not vary with the tuning or reaction adjustments.**

* * *

**Remember when buying a mains unit that not only do you require a certain voltage, but that your set will demand H.T. *current* also, and if the unit is not designed to give the necessary current you may get L.F. instability, distortion, etc.**

# A FAN ABROAD

## (2) IN PARIS WITH A PORTABLE

**How the B.B.C. stations are heard in France, and some other interesting experiences of radio gathered during a recent trip to Paris.**

**By OUR SPECIAL CORRESPONDENT.**

PARIS is a jolly place to be in, and it is a particularly jolly place for wireless enthusiasts, as I found out during a short business stay there a few weeks ago. I hope all readers who intend going on one of those much-advertised "cheap" Continental holidays will take their portables with them; it's worth it.

I had with me a home-made little set based on the "P.W." "Regional Four," and it started by getting me into trouble at the Customs.

"Vous n'avez rien a declarer, monsieur?" asked *le douanier*, in the artful way they speak when they really think you have a bale of silk tucked up your waistcoat!

"Si, monsieur," I said, looking innocent. "Mais . . . cinquante cigarettes . . . une boite entamee . . ."

But he spotted the portable set, and, long after the rest of the passengers had passed the customs I was still arguing, with no avail. I had to pay an *ad valorem* duty of 22 per cent, and probably got off lucky through not being hiked off by a gendarme for failing to declare the set! You should watch this point when you are holiday-making.

### What a Change!

Once arrived at the hotel, the portable began to make up for the 420 francs it had cost me at the Customs. By then it was getting dark; my resting-place for the night was the du Rhone, a hotel near the Seine and the Louvre, and in a good part of the gay city, I should think, for radio reception.

After a wash and a change I made a round of the dials; and what a change! One or two of the bigger transmitters just on the outskirts of Paris caused a mild wipe-out, but nothing like Brookmans Park. Almost immediately I managed to log 5 G B—or should one say the "Midland Regional" now? "le petit Daventry," they call him in France. Anyway, name apart, he is easily one of the best stations on the medium waves; and another good one on the long-wave band is 5 X X—"*le* Daventry."

With the portable's frame aerial I had no difficulty in cutting out the near-by Radio-Paris on 1,725, and getting 5 G B; but Parisians who have outdoor aerials are not always so fortunately placed.

And how strange it seems to have Radio-Paris bellowing in one's ear, at even louder strength than 5 X X is heard in London. London listeners seem to like Radio-Paris, with its advertisement broadcasts, but Parisians mostly prefer 5 X X.

Daventry, and, in fact, both Daventries, have a large French following, and several people to whom I spoke anent radio said that the varied B.B.C. programmes appealed more than the continual "light" music from many of their own stations. We are all grumblers, you see!

### Vast Flashing Signs.

The Eiffel Tower is a bit of a bother, and not only because of its signals. One night I went with some friends to see the illuminated tower, which is now one of the sights of Paris, and we took the portable with us.

The radio station wasn't working at the time, but radio reception anywhere within an eighth of a mile or so of the tower was impossible, owing to the vast flashing electric signs with which the enterprising M. Citroën (the motor manufacturer) has decked it.

### Plenty of Radio Shops.

The Eiffel Tower every night gives a sort of ten-minute programme of changing patterns in electric lights, which all trippers go to see. Many miles of cable, a quarter of a million bulbs and hundreds of high-voltage contacts are involved. The radio interference set up is terrific, and I pity listeners in the immediate vicinity.

There are plenty of radio shops in Paris, but most of them sell complete sets, and it is difficult to buy home-constructor gadgets. I eventually found a shop which stocked a small part I wanted, and made friends with the proprietor sufficiently to be able to call him "mon vieux."

He showed me how to work "Le Mega"—a seven-valve super-het which is very popular in France—and together we had a try on one or two evenings with a short-waver.

I suppose super-heterodyne sets are almost extinct in England. They are very popular in France, chiefly, no doubt, because great selectivity is needed, and because there are not so many powerful stations as there are in England.

Also, there are not many outdoor aerials; reception "sur cadre" (on a frame) is the most fashionable. The frame aerials are made in most freakish and rather inefficient shapes.

The seven-valver I tried has one *bigrille* (screen-grid) stage, a *detectrice* (detector),

(*Continued on next page.*)

### POWER FOR THE TOWER.

Some of the generators situated below the Eiffel Tower to supply power for the famous radio station.

# RADIO'S CHANGING SHAPES.

By G. V. DOWDING, Associate, I.E.E.

RADIO set components started off as crude expressions of electrical factors. And as the years passed they absorbed operating refinements. That is why the variable condenser of to-day is a vastly different object in appearance from its predecessors.

The same thing applies to practically everything that is to be found behind the panel of, or working in conjunction with, a wireless set. There are exceptions; for instance, the fixed condenser of 1930 is much the same as the fixed condenser of 1920.

There isn't scope for development in such a single-purpose object. Two or three decades ago scientists searched around for a convenient method of obtaining electrical capacity in compact form. They hit upon the idea of successive layers of metal and insulating material encased in a neat moulding and provided with two small terminals. 2030, let alone 1930, could ask for nothing better!

### Those Early Transformers.

Some components had most fortuitous beginnings. The radio switch is an outstanding example.

Undoubtedly this divides its origin between the power switchboard and the telephone exchange. A few constructors will remember that if simple on-off switching were required the pre-broadcasting set used a miniature lever switch. For more complicated switching a contraption suspiciously resembling a 'phone jack switch might make its appearance.

The L.F. transformer was developed before wireless telephony became a practical proposition. The first telephony sets used transformers that did not pretend to do anything else but pass energy through.

Indeed, the fact that these transformers could handle one low frequency much better than all the others was an advantage in the spark-receiving sets from which they were recruited. And for quite a long time there was such distortion at other points that the L.F. transformer was accused of being in a quite advanced state of development!

The most popular form was two hanks of wire wound on a bundle of iron wires which were bent over the whole after winding. These "hedgehogs" produced amplification curves as different from "straight lines" as corkscrews crunched out of shape by wild ostriches!

### Began to Expand!

But when they (the early radio designers) really got down to the problem of passing L.F. currents from one valve to another without mangling them, the L.F. transformer began to expand.

Ordinary music and speech ranges over a frequency band of approximately 25 to 10,000, and the perfect L.F. transformer must be able to deal equally well with every one.

And in endeavouring to achieve this ideal it was found that the primary winding of the transformer should have a high inductance, and the core very superior magnetic qualities. Result—bulky bunches of wire on a massive iron framework.

And as you will all know, size and weight were reckoned as good indications of the component's capabilities. The bigger and heavier it was the more the constructor smiled!

But now the transformer has shrunk again, but shrunk not into a shapeless little bunch of wires, but to concentrated electrical efficiency compacted into the neatest of casings.

No longer can L.F. transformers be judged in any way by their weight and sizes. There are these tiny, light ones embodying cores of special nickel-iron alloys, while there are still a few really first-class L.F. transformers that are commandingly heavy.

The L.F. transformer has undergone other changes than those which can be included under the heading of "operating refinements." For this, which after all is the main theme of my article (which is nearing completion!), the variable condenser provides a perfect example.

It was never asked to do more than supply a varying capacity. We met it in the early days of radio as a large, bulky assembly of semicircular plates of metal clumsily (and sometimes rather shakily) held together by brass rods and ebonite plates.

## A POPULAR PARISIAN.

Part of the transmitting gear at the École Supérieure Station, Paris.

### The "Pip" Disappears.

A ·001-mfd. type would have some 87 vanes and project back seven or eight inches from the panel. And now the ·001 has disappeared, the ·0005 mfd. reigns supreme with a thin following of ·0003's and accompanied by a cloud of little reaction condensers. And slow-motion and solidly built vane groups are the order of the day.

The plates, or vanes as they should be called, are mostly shaped like the profiles of snails, so that the capacity is ladled out unevenly instead of evenly, as with the semicircular vanes. The reason is to be found in $300{,}000{,}000 \div (1885\sqrt{CL})$ which, when C is in mfds. and L in mhs., gives the frequency to which your circuit is tuned. To go up in even steps you don't want even steps of capacity added. In short, you want your condenser vanes to have logarithmically corrected shapes. And if it is of modern design this it will have.

Have you noticed how the "pip" of the valve has almost entirely disappeared? I remember a tip published in "P.W." (in its early days) telling readers how they could neatly cover those sharp little spikes on valves!

The plain brass terminal is going and the horn loudspeaker has practically vanished. Filament rheostats are seldom seen, and valve-holders are no longer groups of little brass pipes stuck on black circles.

And, finally, does any one need reminding that the radio set en bloc is no longer a crude assembly of awkwardly shaped objects?

But one thing is certain, and that is that even if "P.W." sets of 1930 hold their own in 1940, radio amateurs of 1960 will regard them as just a trifle demodé!

# A FAN ABROAD (2).

*(Continued from previous page.)*

three intermediate-frequency stages, a B.F. (low-frequency) valve and one *lampe de puissance* (power valve).

"Le Stentor" is a popular commercial four-valver, with *detectrice à reaction* (self-explanatory, I think), and, of course, a *lampe de puissance*. It is only within recent months that French amateurs have realised what a really large power valve is. Previously they used ordinary L.F. valves which were easily overloaded.

### Valves are Cheap.

But a *lampe de puissance* is now the sign of a modern set, and some quite good power valves are available. Generally speaking, French valves are not so good as our own; perhaps that is why multi-valvers are so popular. Valves are cheap, the usual price being about 40 f. (about 6s. 8d.).

My radio-shop friend lent me a short-waver which he had built from a *plan de cablage* (circuit diagram) of his own; a sort of Hartley detector with two L.F. I tried this at the hotel, and got much better results by cutting out the last valve and coupling up the short-waver to the final power-valve stage of my portable.

How strange it seems to hear the B.B.C.'s 5 S W at roaring strength. Skip effect prevents Chelmsford from being heard properly in England; but in Paris he is wonderful. The Dutch P C J is very good, too. Paris's own short-waver, Radio Experimental, which works with one kilowatt on 31·65 metres, was heard only once, and seems to have a skip effect like 5 S W has in England.

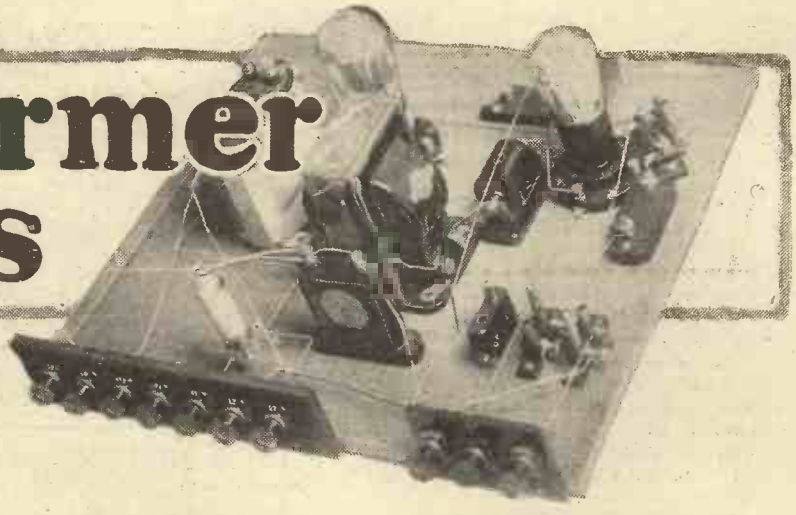
So many French amateurs were to be heard working on the "wavelets" after dark that it was impossible to search for American stations; but there was so much static, artificial and otherwise, that it would have been a hopeless job, anyway.

### Plenty of Static!

Most of this static is artificial, and comes from taxi magnetos and from the Metro (the Paris Underground.) What Paris listeners gain by being right on the waterside (the Seine)—and water is apparently "kind" to the short-waves, as witness our own good transatlantic reception—is lost owing to the heavy amount of static at certain times of the day.

Incidentally, the French for static is *parasites*, an Americanism. A standing joke, therefore, is on the beginner who went to a radio shop and said: "On ma dit que si je n'avais pas de bonnes auditions, c'est parce que j'avais des parasites. Alors je voudrais de la poudre de pyrethre" (*I don't get good reception because of "parasites." So I want a packet of Keatings!*)

# Transformer Troubles



**Is your set a "howling" success? If it is, some of the hints given in this article may be of assistance.**

**By H. REES.**

THE experienced constructor is only too painfully aware of the almost hopeless task of trying to pair certain makes of L.F. transformers in a two-stage amplifier. Despite everything that is done, reproduction is marred by an exasperating drone, or whistle, or is badly distorted. Another transformer is substituted for the one in the first or second stage, and speech and music become everything that could be desired.

With the advent of modern highly efficient instruments, this difficulty is, unfortunately, increased rather than lessened. Thus, the pairing of transformers of the high-permeability-core type demands special care in order to achieve that high performance for which they are noted, and the constructor who will not appreciate this fact may be compelled to do so in a rather expensive manner.

### Purity with High Amplification.

The writer has in mind many components which are fine examples of the pains taken by manufacturers to meet the demands of the aspirant after ultra purity combined with high amplification. It is well known to-day, that results equal to those obtained by R.C. coupling are possible as a result of these efforts, yet, the "matching" problem still exists, and present-day transformers may present the utmost difficulties when it is attempted to use two of the same make and type in one note magnifier.

The experienced constructor fully appreciates the truth of all this, and there is little likelihood of his committing the error just stated. This article, however, is written for the beginner who is devoid of the certain guidance of experience.

### H.F. and L.F. Howls.

When he starts off with a first-class set, reputed to have given satisfaction to thousands, his disappointment is naturally bitter when he discovers that the performance of the newly-completed receiver falls little short of a self-contained artificial menagerie. Proceeding on the hard road of experience, he will soon learn that the odds are heavy against good reproduction if two identical transformers are used, whatever set he is building.

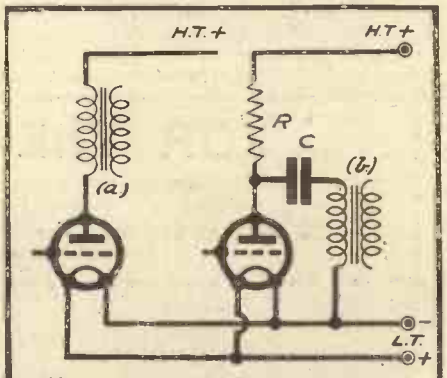
But it is not so simple. Frequently, two instruments of entirely different make fail to pair, notwithstanding that their ratios, inductances, etc., are quite suitable. In all these cases, the first question which naturally suggests itself is: can anything be done? If so, what?

Of course, there is little point in telling the constructor to adhere in future as closely as possible to the designer's specification, or to observe carefully the makes specified in this journal for 2-stage work, from time to time. That is quite sound advice, only that it may come a little too late. The immediate question is, what can be done to *this* receiver, other than spending more on transformers?

Obviously, the first point is to find the source of the howl, whistle, or distortion. A set can oscillate either on the high or low-frequency side, and it may not appear to be very easy to differentiate between the two.

Fortunately, there is a very simple test. H.F. oscillation can invariably be altered by turning one of the tuning condensers,

## SHUNT-FED TRANSFORMERS




In some cases a shunt-feed arrangement will be very useful in preventing saturation of the core by the anode current of the valve.

while low-frequency trouble will generally persist in spite of all adjustments of these devices.

In a badly-designed or defective set, the two forms may be present, but we will now assume that the trouble has been definitely traced to the L.F. side, and, further, that it is not due to poor design, such as bad spacing, causing interaction effects.

A cure, in many cases, can be effected by reversing the primary or secondary leads of *one* of the transformers. The cure may be either partial or complete; oscillation may still continue beyond the limits of audibility, leading still to some distortion.

Reversing the primary or secondary is the first step. It will result in an improvement in most cases.

Having reduced trouble to a minimum by juggling with the connections in this way, there is another little trick that occasionally works wonders. This is the simple device of earthing one or both cores. Try earthing one core first, then the other, then the two together, and you will probably be surprised at the results.

### Other Schemes to Try.

Let us see what else remains to be done if a certain amount of distortion persists. What about a ½- or ¼-megohm leak across the secondary of the last transformer, or even across the first secondary, if it does not reduce volume too much?

The lower the value of the resistance, the better from the reproduction standpoint, but as volume varies in the inverse order, it is really a question of compromise between the two. Generally speaking, 80 to a 100 thousand ohms marks the minimum that can be used across the last stage; but these values would probably be found to cut down volume too much when coupled across the first secondary.

In the worst cases, as stated before, trouble may be most persistent, and may fail entirely to yield to the palliatives just mentioned.

### Final Suggestions.

Sometimes nothing but a new combination will suffice, but there is still one point that may amount to the same thing. That is, to try the present combination the other way about, i.e. put the second stage transformer in the first, and vice versa, then repeat the experiments enumerated above.

A word about transformers of the high permeability variety mentioned at the beginning. These can give very fine results, but the makers of some types advocate the use of a connection somewhat out of the ordinary. Fig. (b) shows the connections advised, and if it is compared with (a), which are the ordinary connections, two things will be immediately apparent: (1) the steady anode current does not flow through the primary due to the condenser C; (2) the primary is isolated from the H.T.

The usual values for the resistance and condenser are 30 to 50 thousand ohms, and 1 or 2 mfd. respectively.

LATEST BROADCASTING NEWS.

# B.B.C. REFORMERS

**THE NEW CHAIRMAN—POLITICAL BROADCASTS—NORTHERN PROMS AT LIVERPOOL.**

THE group of broadcasting reformers that has been working unremittingly for years to secure reorganisation at Savoy Hill seems at last to be breaking through the Parliamentary barrage of the B.B.C.

Major Glyn's question to the Prime Minister about Charter Revision did not receive direct satisfaction, but the invitation to private discussion implied in the answer to the supplementary was very significant; it meant if anything that the Prime Minister was not altogether easy in his own mind about B.B.C. affairs. It is a great pity, however, that so much attention is being paid to rumours, most of which are either of malice aforethought or unfounded in fact. There is probably very little the matter with conditions at Savoy Hill; but all the secrecy and reserve cultivated there plays right into the hands of those who would misrepresent things.

### The New Chairman.

It is believed that the Prime Minister will depend on the new chairman to restore confidence. As to the choice of the successor to Lord Clarendon, this has already provoked more animated discussion than any other public appointment since the War. It is understood that there has been at least one vigorous but inconclusive discussion in the Cabinet.

The case for making Sir John Reith executive chairman has gained ground recently; but there is, of course, a difficult constitutional hurdle to negotiate. It was the purpose of the Royal Charter to create in the chairman a check to the chief executive; once the jobs are combined the check disappears.

This might be all right under the leadership of Sir John Reith; but it would provide, in the opinion of many, a dangerous precedent.

Then Mrs. Snowden has a strong following for the chairmanship; but the difficulty there would be political. Lord Burnham and Lord d'Abernon are the most freely quoted outsiders at this juncture. One thing is clear; that until this appointment is settled trouble and difficulties at Savoy Hill will multiply rapidly.

### Political Broadcasts.

By a curious coincidence Mr. Ramsay MacDonald, Mr. Stanley Baldwin, and Mr. Lloyd George are all appearing before the microphone during Whit Week.

The Prime Minister and Mr. Baldwin are appearing together—it is not often that they are present on the same platform—on Friday, June 13th, when, with Sir Murdoch MacDonald, K.C.M.G., they are to receive the Freedom of the City of Inverness. Sir Murdoch MacDonald has been Liberal M.P. for Inverness-shire since 1922, and he is one of the most prominent figures in the public life of the North of Scotland. All Scottish stations, as well as the National transmitters, will broadcast the ceremony, which is to begin about noon.

The occasion of Mr. Lloyd George's broadcast will be the celebration, on Thursday evening, June 12th, at the Pavilion, Caernarvon, of the fortieth anniversary of his election as a member of Parliament for Caernarvon Borough. This celebration was originally arranged for Thursday, April 24th and had to be postponed owing to the inability of Mr. Lloyd George to be present.

The proceedings will consist of a speech by Mr. T. C. Lewis when he presents a memento, and Mr. Lloyd George's reply. Listeners will also hear selections by the Caernarvon Choral Society, conducted by Mr. T. Osborne Roberts. The ceremony will be broadcast to West Regional listeners and also from Daventry (5 X X) between 6.40 and 7.20 p.m.

### Northern Proms at Liverpool.

The third week of the Northern Promenade Concert Season which begins on Monday, June 9th, will find the venue of the concerts moved from the Free Trade Hall, Manchester, to the Philharmonic Hall, Liverpool.

As hitherto, some part of each concert throughout the week will be broadcast on the National, London, or North Regional wave-length, and the programme for the opening night will again be devoted to the works of Wagner.

The first part of this concert will be broadcast on the National wave-length, and the second from the London Regional transmitter. Isobel Baillie, the well-known Manchester soprano, and Dennis Noble are the solo artistes.

### New Empire Station?

A scheme for a new Empire broadcasting station in England will be discussed by delegates to the Imperial Conference when they meet in London in June. The experiments which were concluded on May 17th to demonstrate the ability of a broadcasting service to the Empire, proved conclusively how much a regular series of news bulletins would be appreciated overseas. The time has come, too, in the opinion of many people when Chelmsford should be replaced by a better and permanent station.

## PICTURES FROM PLANES

The American Army Air Corps is fitting a number of its 'planes with radio picture transmitters of the above Westinghouse pattern. They enable pilots to transmit hand-written messages and hand-drawn sketches by radio to receiving stations on the ground.

# FOR THE LISTENER.

**A Specially Contributed Criticism of Current Broadcasting Events. By "PHILEMON."**

**Who will long be remembered for those wise and witty broadcasts entitled "From My Window."**

### Good English.

WHAT is good English? I listened to a discussion between Mr. St. John Ervine and Mr. Lloyd James in order that I might learn what it was. But I am no wiser; for they talked all the time, and quite entertainingly, about the pronunciation of words, quite a different matter.

But what could you expect from an Irishman and a Welshman? I am compiling a black list of speakers who do not keep to the point. It is already a longish one. Mr. Lloyd James caught a tartar that night.

Mr. Ervine was dogmatic, eloquent, and full of high spirits; and Mr. James couldn't for the life of him keep him on the leash! There was an interlude when one of the Announcers read a passage from the News Bulletin in the dialect of his native county. Very amusing. I wish the news could always be read like that!

### Wembley.

Mr. J. E. Hosking had the time of his life describing some motor-cycling racing on the cinder track at Wembley. He did not describe the scene, so that it was difficult to visualise what was happening.

But, according to Mr. Hosking, everything that happened was "Marvellous! A marvellous race! They're both over! No! Yes! No! Marvellous!"

What Mr. Allison is momentarily—"Shoot, Bastin, shoot!"—Mr. Hosking was all the time! Whatever happened I don't know; but the best thing that happened was—Mr. Hosking! A very excitable fellow!

### The Corridor.

The Signal Box scene from Willesden Junction might, I think, have been better managed. There were lots of varied noises, but what the dickens they were I couldn't

(*Continued on page* 332.)

# YOUR ALTERNATIVE PROGRAMME

**You can get much more fun out of your radio-gram set, or gramophone, if you really know what is happening to and through the spinning black disc, and nobody can tell you better than Dr. Roberts, who was one-time technical chief of the famous Columbia Graphophone Co.**

**By Dr. J. H. T. ROBERTS, F.Inst.P.**

HAVE you ever wondered why a gramophone record is designed to rotate at a speed of 70 to 80 revolutions a minute? We have become so used to this now that it seems a kind of natural speed. As a matter of fact, there is nothing natural about it at all; the speed is entirely arbitrary.

How it came to be the speed of records goodness knows, but I suppose in the early days of recording somebody had to fix a speed and 60 revolutions a minute seemed an easy speed to think of, just as we think of the speed of an express train being 60 miles an hour. Since the speed of 60 revolutions a minute was first used, however, records have been made at the rather higher speed of 70 to 80 r.p.m.

There are, as a matter of fact, several important considerations which enter into the question of a suitable gramophone speed, but whether these were taken duly into consideration by those who first made records I am not able to say—for some reasons it would seem that they were not.

### Some Practical Considerations.

At any rate, whether the speed of, say, 80 revolutions per minute is or is not the best possible speed for all-round purposes, we are obliged now to accept this speed as standard, owing to the fact that enormous numbers of gramophones are in use by the public, designed to run at this speed, and records are made, of course, to work with the existing gramophones. For these reasons it would be almost an impossible task—however desirable it might be in other ways—to make any alteration now in the standard gramophone speed.

It is very interesting to look at some of the reasons which affect the question of record speed.

In the first place, as you know, the original record is cut upon the surface of a wax disc by means of a sharp-pointed sapphire needle. If the speed of the record is too low, the cutting stylus will tend to "chatter," and so set up a series of superimposed waves upon the normal waves on the wax; and when we come to the finished commercial record, this "chatter" will help to swell the "surface noise" from the record.

Those of you who are engineers, or are accustomed to use a lathe, know very well that if you are working upon a job where you want to produce a smooth finish it is generally necessary to turn the work at high speed. As a matter of fact, this very principle is well recognised, even in the recording-room, for when the wax discs are being prepared for recording they are "shaved" in a special "shaving machine" in which they are rotated at a speed many times greater than the recording speed.

Have you tried record-radio yet? It doesn't cost much to fit up, and any old gramophone can be used, as you only require to revolve the record. Your set and its loud speaker and the "pick-up" do the rest.

### Shape of Record Track.

The next point which I want to mention is the shape of the "track," as this also governs to some extent the speed of the record. You know that the track in the ordinary record is of practically constant depth but "waves" from side to side, not unlike a winding canal or river.

As the record is turning the needle lying in the track is forced from side to side.

Now I think you will easily see that if we take any particular frequency, that is, any particular note, the higher the rotational speed of the record the more the waves on the record, corresponding to that note, will be "drawn out."

Going back to our illustration of a winding canal, we can think of a canal in which there are, say, two or three very long gradual windings in a length of a mile, whilst on the other hand we may have very rapid windings so that a much greater number of "winds" occur in a mile length along the canal.

### How Wear is Caused.

Now let us think what will happen if a barge comes along the canal (assuming that the barge is not steered by those on board but is left to make its way along the canal by striking against the banks). You will see that in the case of the long and gradual windings, the barge will graze the bank of the canal but will be very easily deflected, and will make its way along with very little difficulty.

But in the case of the very sharp windings the barge will be continually driven against the bank, first against the right bank and then against the left bank, and before long not only will it suffer damage to itself, but it will damage also the banks of the canal.

This gives us a picture of what goes on when the needle is playing in the record. In a slow-moving record, a given note will be represented by a larger number of waves per inch of the track than in the case of a fast-moving record and, inasmuch as it is only by driving against the walls of the track that the needle derives its vibratory movement, we see that a track with a large number of waves to the inch will more readily be worn away than one in which there are only a small number of waves to the inch.

There are several other very interesting considerations which bear on this question of record speed, but owing to lack of space I must leave these over till a future date.

# FROM THE TECHNICAL EDITOR'S NOTE BOOK.

# Tested and Found—?

## WEARITE COIL HOLDERS.

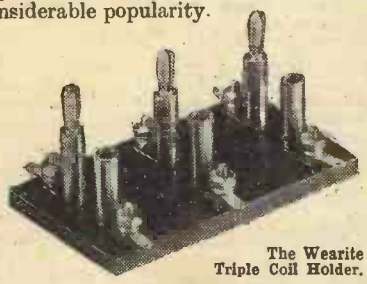
IT is curious how often we have to use improvisations for long periods before someone is smart enough to jump in with proper devices to satisfy our needs.

A case in point are those baseboard-mounting coil holders. For years we have been using these in pairs and threes in sets using plug-in coils.

At last, however, Messrs. Wright and Weaire, who have been doing stout pioneering in radio component design for a long while, have come along with simple double and triple coilholders.

Have a look at the photos of these in this page, and marvel with me that no one has thought of producing such items a long time before this.

Their constructions are perfectly straightforward, and in that they tend both to cheapen and simplify the assembly of many types of sets they should achieve quite a considerable popularity.



The Wearite Triple Coil Holder.

## LOEWE HIGH VACUUM RESISTANCES.

The Loewe Radio Co., Ltd., have a standard range of resistances of the 1 watt type of an unusual and effective design. "P.W." readers will probably know them. They consist of special resistance elements contained in small vacuum tubes, which protect them and ensure that they remain unaffected by atmospheric changes.

Despite their special construction, they are quite reasonably priced.

There are now available full ranges of these Loewe components (from 1,000 ohms to 1 megohm) that can handle ·5 and 1 watt of power.

The ·5 range sells at 2s. each, with cap for clips or with wire ends, and the 1 watt at 2s. 3d.

I have tested a 1 watt 1 megohm sample, and find it completely satisfactory.

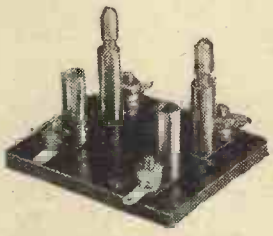
Constructors will discover these latest Loewes of particular use in power and mains units. They are compact and neat in appearance, and are quite robust both mechanically and electrically.

## GOLTONE PUSH-PULL SWITCH.

The push-pull switch due to Messrs. Ward & Goldstone that was recently favourably reviewed in these pages is now available in the three-point form.

## SIEMENS' FULL-O-POWER BATTERY.

In connection with this new H.T. battery, which was recently reviewed in these pages Messrs. Siemens have prepared a price sheet (No. 649) for distribution.



The Wearite Double Coil-Holder.

## GAMBRELL "VOLUVERNIA"

This excellent and well-known volume control which retails at 6s. 9d. has, strange though it may seem, been even further improved.

It is wonderfully smooth in its adjustments, while its resistance settings remain constant despite serious atmospheric and temperature changes.

Altogether it is undoubtedly a first-class component, and one I can recommend to the attention of "P.W." constructor readers.

## REVISED BATTERY BOOKLET.

The Standard Battery Company have revised their well-known battery booklet and interested "P.W." readers should secure copies, which are available post free on request.

## THE ELECTRAMONIC PICK-UP.

The Electramonic Co., Ltd., recently sent me one of their pick-ups and carrier arms for test.

The arrangement is of rather unusual design, and the needle is carried in an aperture underneath the straight end of the device instead of in the usual well-defined socket or chuck.

On test the pick-up gave moderately good results, and there was no visible signs of wear on a record played some dozen or so times. But a slight chatter was noticeable, though only to the trained ear, I think. Certainly it did not show up very much on a moderately wide point response curve that was taken.

## NEW SQUIRE PRODUCTION.

The novel feature of the new cradle model No. 100 loud speaker due to Fredk. Squire, which retails at 28s. 6d. excluding the unit, is that it has two cones, the one supported and the other free-edged. The two cones are of dissimilar sizes and are focussed in opposite directions.

The larger cone in front is the one that is supported. This combination of cone sizes and cone fixings seems to me to hold many more possibilities than the usual haphazard, or what appears to me to be haphazard, multi-cone assemblies.

As a fundamental idea the multi-cone scheme may or may not be a step in the right direction, of that I am not sure, but I do know that its practical application is sometimes attended by snags.

However, this latest Squire arrangement does give good results, and the two cones do seem to justify their presence.

### WHEN YOU ARE BUYING—

### 16. A REACTION CONDENSER.

**Remember that there are two very different types used in modern receivers.**

**There is the quite ordinary variety which is really only a normal variable, such as is used for tuning, of the appropriate capacity.**

**Then there is the "differential," which is quite different. This has three terminals joined to three sets of vanes, two of which are fixed.**

**But not all variable condensers having three terminals are necessarily of differential design. This is an important point.**

**No other kind of condenser will do the work of a differential in the special differential reaction arrangements.**

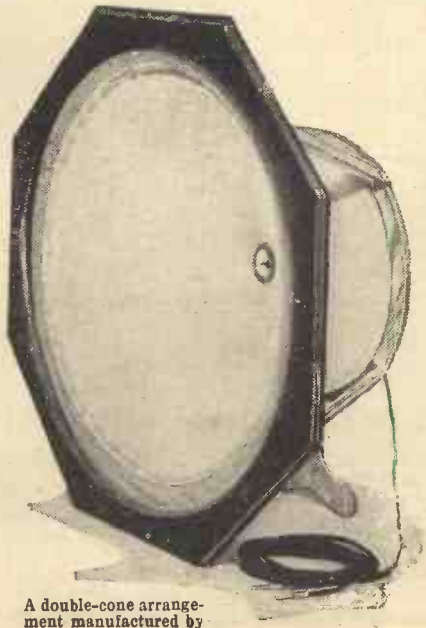
**A reaction condenser does not need as fine an adjustment as a tuning condenser so a slow-motion control is not a necessity.**

## "REALISM FROM RECORDS."

This is a publication, recently issued by Gambrell Radio, Ltd., that deals with the Novotone Radio-Gram device.

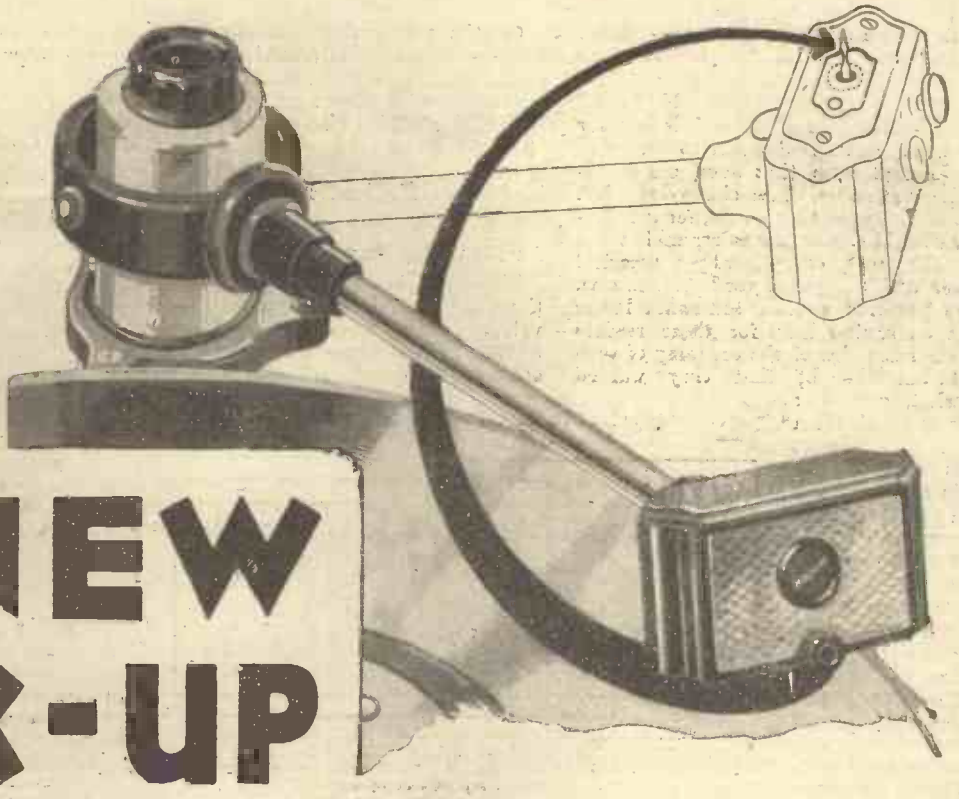
## OSRAM PHOTO-CELLS.

The G.E.C. people have published a folder dealing with these devices that should prove of interest to radio experimenters.



A double-cone arrangement manufactured by Fredk. Squire.

Blue Spot
TRADE MARK



# A NEW PICK-UP

Designed for the true critic and lover of gramophone music, this wonderful pick-up will discover new beauty in your gramophone records. Coloration and depth of tone which you have not previously heard will be revealed. All that is incised on the record will be reproduced without over emphasis and without attenuation. Ask any good wireless dealer for a demonstration and you will be both delighted and amazed with the realism of the reproduction.

# BLUE SPOT 88

***Price £3.3.0 complete with volume control.***

Blue Spot's new pick-up, Blue Spot 88, incorporates all the improvements resulting from year's of patient research. Tracking difficulties have been overcome by positioning the needle continuously tangential to the record groove. The tone-arm is mounted on ball bearings giving perfect freedom of movement without risk of chatter. The volume control works smoothly and noiselessly at all positions. By turning the pick-up over to the right it is automatically held free and clear of the turntable, leaving both hands free for changing records and needles. Every detail has been carefully studied to ensure the best possible results

**F. A. HUGHES & CO., LIMITED, 204-6 Great Portland St., London, W.1**

'Phone: Museum 8630 (4 lines)

*Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (Sheffield and London), LTD., 100 London Road, Sheffield. 'Phone: Sheffield 26096. 22 St. Mary's Parsonage, Manchester. 'Phone: Manchester City 3329*

# The "NEU

A four-valve "Neutype" i powerful. Just th loudspeaker work and completely stan in a special circuit f

**Designed and Described by The "P.W." R**

OUR readers seem to have appreciated our recent effort to provide them with a highly economical yet sensitive receiver in the form of the "Neutype" Three (described in Popular Wireless for April 26th), and our decision to revive in a modernised form that good old stand-by, the neutralised three-electrode valve. We rather thought they would, for it is certainly useful to know how to assemble when required a really exceptionally economical receiver which is yet of good performance. So we prepared another somewhat larger design on similar lines for those readers who liked the idea of the economy of such a set but thought that they wanted somewhat greater power to enable them to use it on indifferent aerials and yet be certain of a good all-round loud-speaker performance.

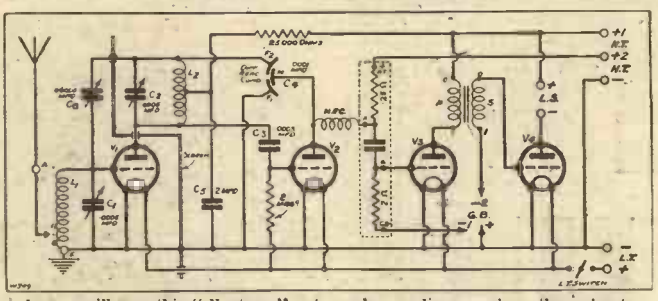
For them we have produced the "Neutype" Four, which is a set based upon exactly the same fundamental idea as the Three, but just sufficiently increased in power to make you rather more independent of your aerial. It will be remembered, probably, that in the case of the three-valver we warned the reader that to get really satisfactory loud-speaker performance on foreign stations you must be prepared to use an aerial of reasonable efficiency.

On the poor aerials which many of us are compelled by circumstances to use rather more power is needed. Here it is advisable to use either a set with a screened-grid H.F. stage, or else one on the lines of the "Neutype" Three, but with rather more power on the L.F. side; such a set, in fact, as the receiver we are about to describe.

### An Economical Proposition.

Here you have a set which possesses the same special attractions as the three-valver to which we have referred and certain individual merits of its own. Its outstanding point, of course, is strict economy in first cost and maintenance, for you will observe that there is no expensive screened-grid valve to buy (and eventually to renew), and running costs can be kept very low.

## EXAMINE THIS CIRCUIT.

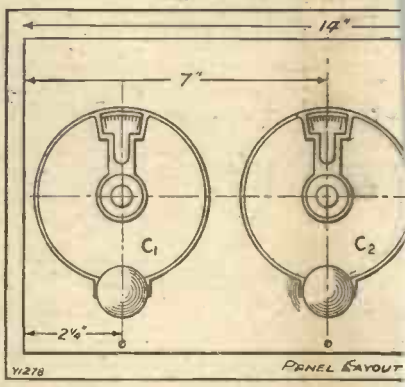


As you will see, this "Neutype" set employs ordinary valves throughout, but special neutralising and reaction arrangements make it an inexpensive rival to the most costly outfit.

The three-valver, it may be remembered, could be kept down to an H.T. consumption of somewhere about 7 milliamps, if only an ordinary power valve were used, and the Four is not very much more greedy. To be sure, there is one extra valve, but this need not be of a heavy consumption type, and it is quite possible to keep within a 10-milliamp limit with this set. So you will appreciate that it is, unlike many powerful 4-valve receivers, one that is suitable for running from dry H.T. batteries.

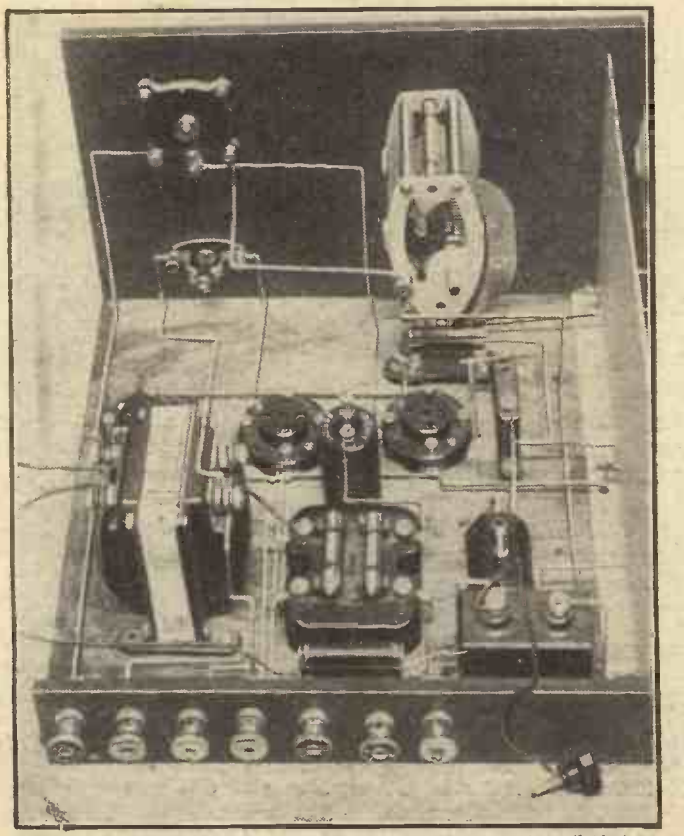
To do this, naturally means using only an ordinary power valve in the last stage, and so you would have to be rather careful about overloading, only using the full power of the set on quite weak stations, and keeping others down to reasonable volume by reducing reaction and even detuning a little on the stronger ones; but it is interesting to note that such

## AN ATTRACTIVE




The controls are, as you will see, placed so th without sacrificing panel a

## POWER AND PURITY.



This is the detector and L.F. end of the set. Adequate power is available for working a large loud speaker with purity and stability on distant as well as local stations.

### HERE ARE THE PARTS YOU WILL RE

1 Panel, 14 in. × 7 in. (Goltone or Paxolin, Resiston, Trolite, etc.)
1 Cabinet to fit, with baseboard, 10 in. deep (Camco or Osborn, Pickett, Kay, etc.).
2 ·0005-mfd. variable condensers (Lissen or J.B., Lotus, Ormond, Ready Radio, Dubilier, Igranic, Burton, Polar, etc.).
2 Vernier dials (if condensers are not of slow-motion type) (Igranic or Formo, Lissen, Ormond, Brownie, Lotus, etc.).
1 ·0001, ·00013 or ·00015 mfd. differential reaction condenser (Ready Radio or Ormond, Lissen, Lotus, Formo, Wearite, Burton, Dubilier, Magnum, Polar, etc.).
1 L.T. switch (Lotus or Benjamin, Igranic, Lissen, Wearite, etc.).
1 Standard "P.W." screen, 10 in. × 6 in. (Ready Radio or Paroussi, Magnum, Wearite, etc.).
4 Sprung valve holders (Lotus or Igranic, Lissen, W.B., Junit Formo, Wearite, etc.).
2 Single-coil holders (Igranic or Lissen, Wearite, Lotus, etc.).
1 Neutralising condenser (Burgin or J.B., Gambrell, Igranic, etc.).
1 25,000 or 30,000-ohms resistance and holder (Ready Radio or Ferranti, Lissen, R.I., Igranic, Varley, Dubilier, etc.).
1 2-mfd. condenser (T.C.C. or Lissen, Ferranti, Dubilier, Hydra, Mullard, Loewe, etc.).
1 ·0003-mfd. fixed condenser (T.C.C. or

# MANY STATIONS ON THE

# UTYPE" FOUR

**r of exceptionally attractive design, the s easy to build, inexpensive, selective and e receiver you want for long-distance Ordinary plug-in coils, ordinary valves, dard components are employed throughout ormation of a completely modern character.**

**ESEARCH DEPARTMENT.**

economy is possible. No doubt, where you have the means of providing rather more current—say, up up to 14 or 15 milliamps—you will take advantage of the greater power-handling capacities of the super-power type, and use one of these valves in the last stage. You will then discover that the "Neutype" Four is capable of providing you with a tremendous amount of volume at good quality. Even then you must avoid overloading on the local station, because the power of the set is really very great.

A good method of limiting the volume of such a station, by the way, is to use a little judicious detuning on the two dials, setting one a little above the wave of the station and the other a little below it, a proceeding which in many cases improves quality and enables you to obtain reproduction of a very exceptional character—decidedly better, in fact, than that of many a smaller set worked somewhere near full out.

**Efficiency Not Sacrificed.**

We have assembled the "Four" on somewhat different lines from those adopted in the case of the three-valver, and the reader may be interested to see just what those differences are, and to hear the reasons for them. Well, it is largely a matter of cost, for we thought that this was one of the most important factors in a design of this sort, in which we had expressly set out to be as economical as was reasonably possible. Of course, we have carefully avoided paring cost to the point of inefficiency, but it must be remembered that there is such a thing as a reasonable compromise.

**Only Two Coils Used.**

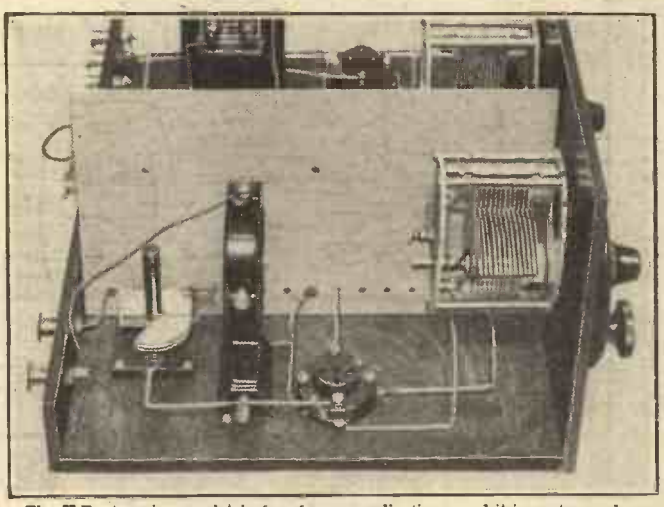
The differences, then, are mainly matters of keeping down the cost of the four-valver to a figure very little above that of the Three. They are mainly on the H.F. side, where we decided to use a simpler and still more economical system of tuning and inter-valve coupling.

In the three-valver we used commercial wave-change coil units, which gave the user the convenience of working on either medium or long waves by merely operating a couple of knobs on the panel. It was decided to drop this feature in the case of the four-valver, and accordingly we have chosen plug-in coils of the type which a great number of constructors will have on hand. Therefore there will probably be no need to buy any special coils for the set, and you will see that this makes a very considerable difference in your budget.

Of course, you no longer have the advantage of wave-change switching, but remember what we said about a compromise. You cannot have everything, but what we have done is to see that coil-changing, when going over from the ordinary to the long-wave band, is made as simple as possible. Accordingly, we have strictly limited the number of coils in use.

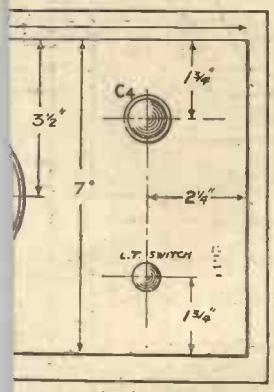
(*Continued on next page.*)

## STATIONS BY THE SCORE.



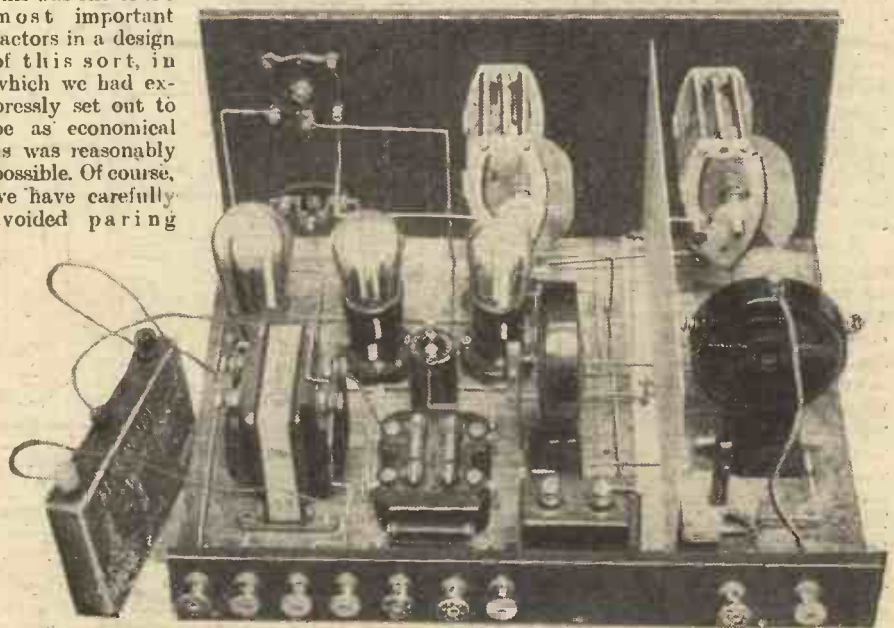
The H.F. stage is completely free from complications, and it imparts wonderful selectivity and distance-getting properties to the set.

## PANEL




t "searching" is facilitated pearance.

## REMARKABLY COMPACT ASSEMBLY.



No baseboard space is wasted in this attractive four-valver, although the layout is such that no efficiency is lost through the "electrical" crowding of components. One simple screen and a proper placing of coils render the H.F. side sensitive and stable.

**QUIRE.**

Dubilier, Lissen, Goltone, Mullard, Igranic, Clarke, etc.)
1 2-meg. grid leak and holder (Lissen or Igranic, Edswan, Dubilier, Mullard, etc.).
1 H.F. choke (Keystone or Varley, Lewcos, Lissen, R.I., Igranic, Lotus, Dubilier, Ready Radio, Wearite, etc.).
1 R.C. coupling unit, anode resistance about ¼ meg., grid leak, 1 or 2-meg. (Lissen or Dubilier, etc.).
1 Low-ratio L.F. transformer (Telsen or R.I., Lissen, Ferranti, Varley, Lotus, Igranic, Lewcos, Cossor, Mullard, etc.).
1 Terminal strip, 14 in. × 2 in.
9 Engraved or indicating terminals (Eelex or Igranic, Belling & Lee, Clix, etc.).
Screws, wire, flex, G.B. plugs, etc.

# LOUDSPEAKER

## THE "NEUTYPE" FOUR.

*(Continued from previous page.)*

and have got it down to only two. Hence you have not the nuisance involved in many of the larger sets of older design, where there might be as many as four or even five coils to be changed. Just two is not so bad, after all, and it really only takes a few moments. The only possible nuisance about it, as the experienced user will probably agree, is that you have to open the lid of the set to perform the operation, and so you have to enforce a rather rigid domestic rule about putting vases of flowers and other objects on the top of the cabinet!

The low-frequency side the receiver follows absolutely standard and straightforward lines, just as did the "Neutype" Three; and, like that set, the whole circuit is one carefully worked out to bring up to date and develop to the full the sensitivity and selectivity available in the older neutralised circuits.

**Circuit Design.**

Selectivity of course, is a very big point, for it is not at all an easy matter to obtain a good degree of it with the screened-grid valve, although it is quite simple with the neutralised type of circuit. It is not so much a matter of the difference in the characteristics in the screened-grid and neutralised valves themselves as in the types of circuits used with them; but, whatever the reason, it is a weighty argument in favour of the neutralised circuit.

A glance at the circuit diagram will help to bring out these various points more clearly. First, you will see that the aerial is auto-coupled to the tuned-grid circuit by means of an "X" coil, thus dispensing with the separate primary sometimes used here. The "X" type gives quite satisfactory results for our present purpose, and simplifies matters somewhat.

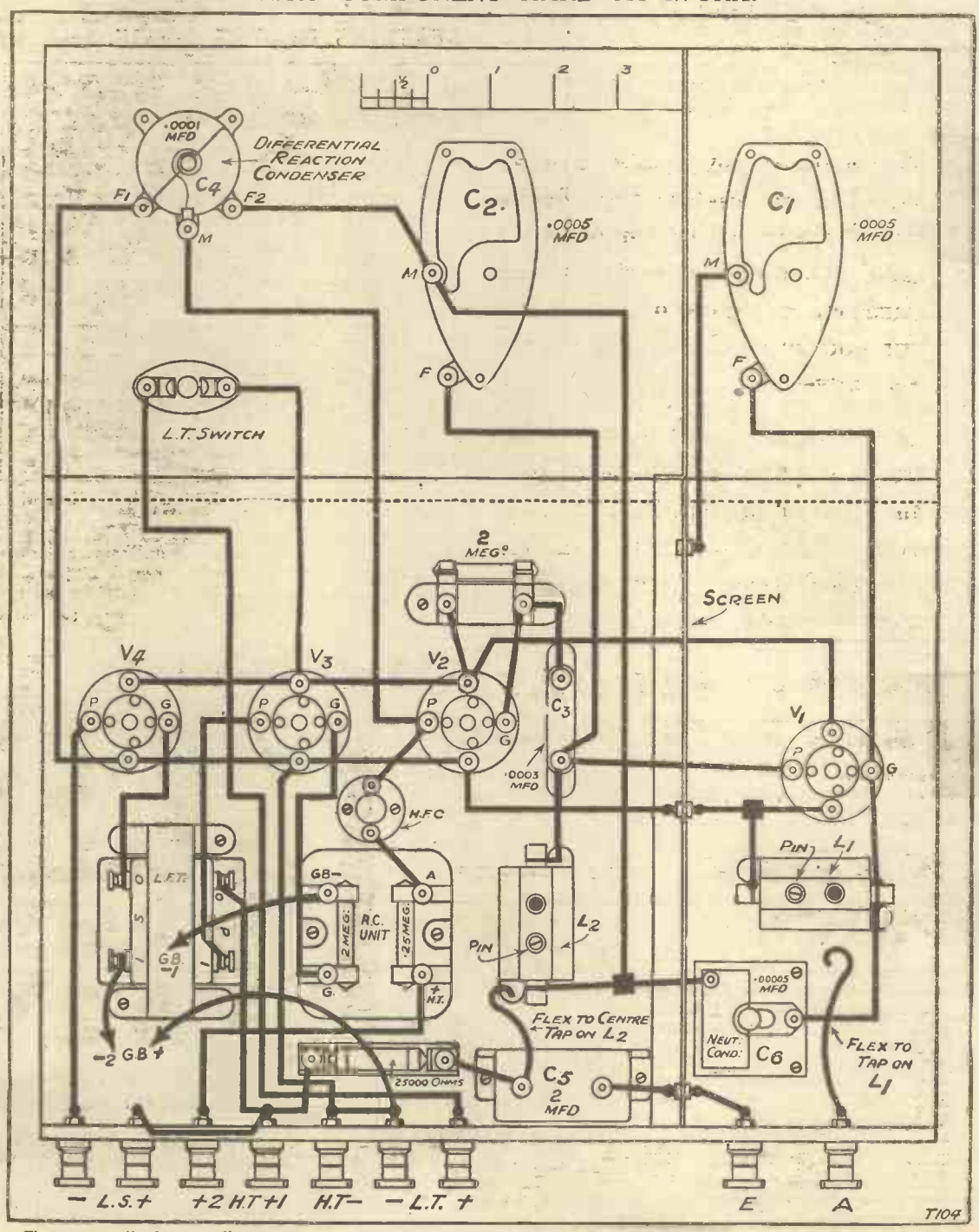
The H.F. intervalve coupling is quite different from that of the "Neutype" Three, and you will observe that it takes the form of a centre-tapped tuned anode.

The rest of the circuit is quite normal and straightforward, except perhaps for the de-coupling resistance of 25,000 ohms and condenser $C_5$. This we found necessary to ensure stability when aged H.T. batteries were used, so we included it as a safety precaution.

Constructionally, there is only one point to mention, and that is a warning about the wires which pass through the screen. These *must* be insulated, and you should also make careful note of the points at which connections are made to the screen itself by means of screws and nuts placed in the perforations along its lower edge.

Now for some summarised operating data. Valves should be two of the H.F. type for $V_1$ and $V_2$, one L.F. for $V_3$, and one power or super-power for $V_4$. The coils will both be No. 60 size for the medium waves and No. 250's for long waves, one being an "X" coil ($L_1$) and one centre-tapped ($L_2$). As regards H.T. voltages, you should put about 100 to 120 volts on H.T. + 1 and 60 or 70 volts on H.T. + 2. Grid bias will depend very much on the valves, and should be settled by reference to the maker's data slips received with them.

## EVERY COMPONENT HARD AT WORK.




There are no "refinements" of doubtful merit in this first-class four-valver. Every part used in it has a definite and important job allocated to it.

# COMPARE THESE FIGURES WITH THOSE OF ANY OTHER 2-VOLT POWER VALVE

## P240

The goodness of a valve is determined by the highest amplification factor for the lowest anode impedance. This is expressed as mutual conductance, therefore the higher the mutual conductance the better the valve.

The mutual conductance of the Mazda P.240 is considerably higher than that of any other 2-volt power valve. It will operate a moving coil loud speaker with most satisfactory results.

## THESE FIGURES PROVE IT . . .

| | |
|---|---|
| Amplification Factor .. .. .. | 7 |
| Anode A.C. Resistance (ohms) .. .. | 1,900 |
| Mutual A.C. Conductance (MA/V) .. .. | 3.7 |

## MAZDA P. 240 PRICE 15/-

*The Amazing*

# MAZDA RADIO VALVES

*With Mazda valves in all positions your set will give a performance many times better than before.*

THE EDISON SWAN ELECTRIC CO., LTD.,
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V.48

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# *TELL YOUR FRIENDS ABOUT IT!*

# CAPT. ECKERSLEY'S QUERY CORNER

**TRANSFORMER RATIOS—WHERE THE HUM STARTS—AN AERIAL SURPRISE —SPARKING PLUG INTERFERENCE.**

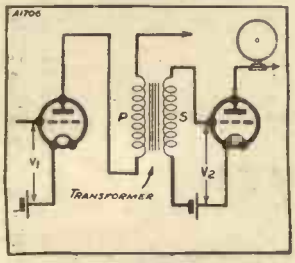
**Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P. W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.**

### Transformer Ratios.

O. P. B. (Boston).—"Why is it that most low-frequency transformers have a ratio of between 2–1 and 5–1. Surely a higher ratio of even 50–1 could be employed to increase the step up in signal strength?"

No! You see you are limited in two ways. Consider two valves with transformer connection as in the sketch below. Now the impedance of the primary (P) of the transformer has to be of value equal to two or three times the valve impedance.

## CHOOSING A TRANSFORMER




Showing how transformer ratios have to be limited.

Now that means quite a few turns of wire. If you're going to put 50 times the turns on the secondary you're going to make an awfully unwieldy thing.

Secondly, suppose $V_1$ was a volt. Suppose the valve mag. was 10 effective. Then with a 50 to 1 transformer, $V2 = 1 \times 10 \times 50 = 500$ volts! That would saturate the last valve a bit, wouldn't it? Step-up ratios of 50–1 cannot be used even if transformers having such a step-up could be manufactured.

* * *

### Where the Hum Starts.

B. E. H. (Norwich).—"I have in use a three-valve receiver using A.C. valves—one H.F., detector, and 1 L.F. I find that although the H.F. and L.F. stages operate quite free from hum using either indirectly or directly heated valves, I have great difficulty in preventing hum with either of the above types of valves in the detector position.

"Is this a normal fault, or does it point to something radically wrong with the receiver?"

No! It's more difficult to eliminate hum from the detector valve than any other. And if you will follow me, obviously so.

Because the detector is the first *low*-frequency stage really. If you have "hum" it's because the valves magnify the tiny disturbances due to irregular filament emission or irregular feed due to other effects.

As you put more and more magnification on to the source of hum, so the hum becomes louder. Your H.F. valves, however, only magnify *high* frequencies, not *hum* frequencies. It's the detector that starts dealing with low frequencies and the detector is the low-frequency valve farthest back in the *low*-frequency chain of amplification.

That is the theory in general, there are other points which I can't go into in this short space.

* * *

### An Aerial Surprise.

T. E. C. (Camden Town).—"I had a rather peculiar experience the other evening, and should be very glad if you could explain the reason. An efficient outdoor aerial is in use, but it is necessary for me to use a fairly long lead-in through the house.

"I had been listening the whole evening, and was rather surprised at an apparent increase in selectivity in the receiver on the two Brookmans Park transmissions, but they were still at their normal volume.

"Judge my surprise when I found that my outside aerial was entirely disconnected, and I was merely picking up on the length of lead in the house. Does this infer that my outdoor aerial is quite useless, and that I might just as well take this down?"

## CLEANLINESS IS ESSENTIAL.

It is necessary that all wander-plugs and spade terminals be kept scrupulously clean.

This is very common in my experience. I so frequently find that sets are "over-aerialed."

In general, one may say that increasing the size of the aerial does increase the signal, but then, the aerial must be free from capacity effect to earth. The outdoor part of your aerial may pick up something, but the lead-in, having various capacity effects, shunts away the energy.

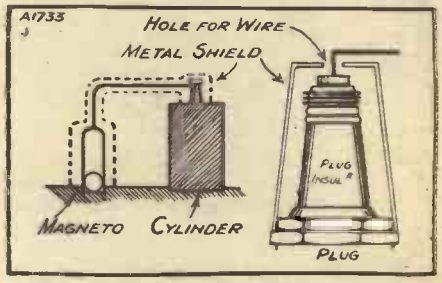
Furthermore, the outdoor part may merely add resistance which cuts down what it may pick up. For reasonable sensitivity and best selectivity, I always say use as small an aerial as possible.

* * *

### Sparking Plug Interference.

J. B. (Birchington).—"I have tried to use my portable receiver while travelling in my motor-car. I can receive several stations quite clearly, but reception is spoilt by a very rapid clicking noise in the loud speaker. It has occurred to me that this is caused by vibration, but all my attempts to mount the receiver to avoid vibration have been unsuccessful. What causes this noise?"

## A MINIATURE TRANSMITTER.




The motor-car sparking-plug acts as a small wireless transmitter.

Dear old magneto noise! The spark plug is the generator of high-frequency oscillations and the spark plug may act like an aerial.

When using a very sensitive very short-wave receiver you can hear magneto disturbances several miles away. The same effect occurs in aeroplanes, and we had to study how to get over the trouble years ago.

The only way is to enclose every bit of wiring in metallic shielded cable *and to enclose the sparking plug, too.* Even the little conductor of a sparking plug running through the insulator will radiate waves. To give you an idea of what to do, remember that *everything* must be enclosed, and see my sketch for a diagrammatic idea of how to do that.

### OUR "MAGIC" SETS.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a regular reader of your ever interesting journal POPULAR WIRELESS since No. 1, I take this opportunity of adding my name to what must be a host of appreciative readers of your ever interesting circuits and constructional articles which appear from time to time. Last, but not least, I consider your "Magic" Series the best proposition any amateur constructor could wish to construct. No word of praise on my part would adequately express the long felt want that these circuits must fulfill. I have personally constructed for my friends according to their particular needs the whole series, from "Magic" One to "Magic" Four.

The only suggestion forthcoming is that we are looking forward to your adding yet further "Magic" by the introduction of The "Magic" S.G. Three of a de luxe nature, not necessarily with a pick-up arrangement. I trust this may be a pleasure in store. It would perhaps meet a popular demand. Anyway, I must conclude this with many thanks for what you have given us, and for what we may be about to receive.

With best wishes for the success of your paper,

I remain,

Yours respectfully,

Devon. S. TAVENER.

### THE "TINY" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—The following particulars of the "Tiny" Two which I have constructed may interest readers. Not only has it cost me much less than I anticipated, but the results have been amazing. A better name would be the "Gigantic" Two.

Instead of ebonite for the panel, I used three-ply wood. This and the rest of the woodwork I polished by rubbing in cellulose paint, as when rubbing in a spirit stain. This gives a very good effect in any colour paint, and a high insulation finish is obtained.

Principal components used: Brookmans condenser, Wavemaster differential condenser, Hypermite transformer, Benjamin rotary switch, Lissen grid leak and condenser, Lissen coil holders, Marconiphone valve holders, Mullard L.F. and H.F. valves, Ever-ready 60 v. and 4½ v. batteries (dry), Western Electric 'phones, Exide 2 v. accumulator, Tunewell coils (75 and 35). Cost, without 'phones, £3 5s. 7½d.

Results (6 miles north of Oxford Circus):

1. With 60 ft. indoor aerial and an earth: London Regional and National very loud on speaker; easily separated.

2. With 60 ft. aerial and no earth: Practically the same.

3. With no aerial or earth: Good strength on speaker with 120 v. H.T.; very loud on 'phones with 60 v. H.T.

4. Carrying set in motor-car, wearing 'phones, neither aerial nor earth, travelling West of London: Very good strength National and London Regional.

Yours faithfully,

W.5. E. J. SUTTERS.

## CORRESPONDENCE.

## OUR "MAGIC" SETS.

**THE "TINY" TWO — REPLACING AN AERIAL—THE "MAGIC" ABROAD.**

**Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.**

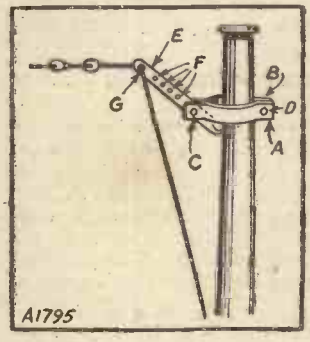
### REPLACING AN AERIAL

The Editor, POPULAR WIRELESS.

Dear Sir,—Some of your readers will probably find the idea illustrated in the diagram a boon for replacing broken aerials. I have tried it and found it works quite O.K.

First make two brackets, A, B, of 1½ in. × ¾ in. iron strip and bend to fit loosely round the bottom of the pole, and drill bolt holes, C. D. Then make the lever E, and drill holes F for the fulcrum and G for the rope from a strip of iron, 6 in. × 1 in. × ¼ in. Then pull the aerial rope (halyard) through hole G, and leave a fair amount of slack. It will be found that this fixing can be pushed to the top of the pole with a prop or similar object with ease.

AN AERIAL TIP.




Yours truly,

Birmingham. E. SMITH.

### THE "MAGIC" ABROAD.

The Editor, POPULAR WIRELESS.

Dear Sir,—After having a set utilising your "Magic" detector circuit in use for the past five months, I am writing to say how very satisfied I am with it, both on the broadcast waves and short waves.

The set, as I am using it, comprises the "Magic" detector circuit, followed by three stages of R.C.C. amplification. An output filter is built in, and a volume control is provided between the 1st and 2nd L.F. valves, the last valve being a super power.

It is rather futile to attempt to state the number of stations possible on the loud speaker whilst we are anywhere within a thousand miles of Cape Finnisterre, they are too numerous to mention; but it might interest you to know that good loud-speaker reception is obtained during the whole of the voyage between London and Monte Video, either on the broadcast waves or the short waves, and very often on both. Atmospherics sometimes spoil the broadcast wave reception, but not the short-wave reception.

The set, as you will have gathered, is in use on board ship, where aerial conditions are not so good as might be desired. For instance, the aerial has to pass the ship's funnel at a distance of but eight feet, and the diameter of the funnel is equal to rather more than one third of the length of the aerial.

In the text of your article on the "Magic" circuit you say the arm of the potentiometer should be kept nearest to the negative end for smoothest reaction. I find the reverse to be the case, and so keep the arm usually slightly towards the positive end from the mid-way position. The impedance of my detector valve is, according to the makers, 13,000 ohms.

The cabinet housing the set measures 27 in. long, 9 in. high, 12 in. deep, and the panel is 21 x 7 ins. It is thus possible to keep all the coils, etc., necessary for the set together.

The loud speaker in use is the "P.W. Mural Cone," and it, like the set, is very satisfactory. The tone and volume-handling capabilities are all that one could wish.

The speaker, however, is made up as a corner baffle, for it occupies less space that way than exactly to the design.

It only remains for me to say again that the set is more than satisfactory, and the combination of set and speaker remind one of the old saying, "They fit like a hand and a glove."

With thanks to the people who designed it all.

Yours very sincerely,

Buenos Aires. "ELECTRICIAN."

### THE "TINY" TWO AGAIN.

The Editor, POPULAR WIRELESS.

Dear Sir,—I thought you would like to know that I have built your "Tiny" Two and your "Economy" Three.

Living in Northern Ireland I did not think either set would be powerful enough, so I added another transformer-coupled stage to your "Tiny" Two, and instead of a resistance capacity coupler I used a transformer in the other.

Both sets are extremely good and of pure quality.

I have not had time to test the "Economy" Three as I only finished it recently but I think it will bring in plenty of stations.

Yours faithfully,

N. Ireland. H. E. REDMAN (Major).

---

# SHORT-WAVE NOTES.

**By W. L. S.**

I AM still more convinced, after a fortnight's listening (during bad conditions) with my stage of tuned screened-grid H.F., that it is very definitely worth using. As far as sheer "brute-force" amplification goes it is quite equal to an extra note-magnifier, while it does not bring up the background noises in the way than an L.F. stage usually does.

And I am also sure that signals that on a detector and L.F. are too weak to be readable, or even audible, are brought into the range of one's receiver if a good screened-stage is used.

Two or three readers have asked for particulars on A.C. H.T. supply for screened-grid units. I can only say that I have met no problems in this direction at all.

**Extra Det. Smoothing.**

I have found all along that practically any proprietary unit, together with an extra smoothing unit for the detector circuit, gives such perfect results on short waves that one definitely would not know that batteries were not in use.

The extra smoothing for the detector should consist of a 25 or 32-henry choke with at least 4 mfd. from the "set" side of it to earth.

Short-wavers working from electrolytic rectifiers are not always too satisfactory. I have found, not on account of ripple of any kind, but because of a slight voltage variation that is often present, and causes the set to slide in and out of oscillation at irregular intervals.

I have found that a perfect cure for this is simply to use a Neon tube across the output from the eliminator. Naturally a commercial type with the resistance incorporated in the base, such as can be obtained at any lighting store, should be used. This will not draw more than about 25 milliamps at 250 volts, and acts extraordinarily well as a "buffer."

A little while back I remember receiving a letter from a mystified reader—I replied to it by post—querying the purpose of a very mysterious-looking tangle of wires visible from the Great North Road near Baldock. I have since found that it is the aerial of a receiving station used in the tests with G 2 G N, the Olympic, and G 2 I V, the Majestic. G 2 A A, the land station, is at Rugby.

Mr. Easter, my regular correspondent from Cincinnati, has kindly offered to prepare a really new and up-to-date list of short-wave broadcasting stations chiefly from information received direct "from the horse's mouth." I hope to be able to publish it very shortly.

Apropos my remarks about an earth which produces hand-capacity effects on my all-screened set as soon as it is connected to filaments, while they are absent with no earth, an Oxford reader kindly writes to tell me that he has previously experienced the same, but has cured it by using a different earth.

He says "The finest earth I have ever tried consists of about four feet of ¼ in. copper tube wound in a spiral and buried a foot below the surface, connection being made by a length of 7/22 enamelled aerial wire."

Incidentally, those who believe in renovating their aerials at all frequently probably have, like myself, hanks and hanks of 7/22 lying about or hanging up in the garage; two fairly big coils of this, unrolled loosely and completely buried about a foot down, also make quite an efficient earth.

**Simple and Efficient.**

You will naturally find a good earth of paramount importance when using a mains unit for H.T. supply, and I think an "inferior article" is the cause of 90 per cent. of the failures in this direction. Naturally, though a counterpoise is often more efficient than an earth from the reception point of view, it is quite a different tale with some of the supply mains, and it often becomes essential to earth everything possible.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

*The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.*

*The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

# QUESTIONS AND ANSWERS.

### ACID ON THE CARPET.

"AXMINSTER" (Nuneaton).—"The accumulator carrying-case is provided with a leather handle. I was carrying it across the dining-room quite carefully when the handle suddenly broke in my hand, and the battery fell over on to its side.

"Fortunately, it was right at the edge of the carpet, but a small pool of the acid from the battery ran out on to the floor-boards and just touched one end of the carpet. Not long afterwards my father-in-law came to see us, and I happened to mention it to him, and he immediately got very excited.

"He sent me post-haste to the stores for some ammonia, and with this he sponged the carpet, which is a new one, and spent a good half-hour in washing the acid out. The carpet looks perfectly O.K., but he still says that it may rot away.

"I have examined the leather handle in the case, and find that it had become rotten, which he says was due also to the acid. Is it a fact that it affects leather like that, and do you think it will ruin my new carpet?"

The sulphuric acid used in accumulators is a mortal foe to carpets, clothes, leather, upholstery, urtains, metal work and, in fact, to practically everything in the home, including you and your family!

It is a deadly poison, and under no circumstances should it be allowed to come into contact with cuts or abrasions; for, if it does, it may cause no end of trouble. And you have every reason to thank your father-in-law profusely, for he undoubtedly saved the carpet for you!

If acid is spilt in this way, the only hope is to neutralise it as quickly as possible with an alkali such as ammonia, borax, or a strong solution of soda. We think that the prompt treatment probably saved the carpet, but you have in the case of the leather handle a perfect example of the sort of damage which accumulator acid can do.

Even a small spot or two spilt on a leather handle will in time eat it away and rot it, and you cannot be too careful, when carrying the accumulator to and from the charging station, to keep it away from your clothes.

If it is placed inside your wireless cabinet, do not spill the acid in putting it in place, for any drops which fall on the wood are liable to "rot" it. It is a good plan to make a small wooden tray for the accumulator, using cheap white wood, so that any small drops which may trickle down its case may damage the tray, but will be prevented from touching anything of value.

Be equally careful of the carrying handle, and always wipe over the outside of the accumulator with a duster. (It had better be an old duster, for you will find that it will attack this, too, and ruin it in time.)

## CAN WE HELP YOU WITH YOUR SET?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this, an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form, you will know exactly what information we require to have before us in order to solve your problems.

**LONDON READERS PLEASE NOTE:** Inquiries should NOT be made by 'phone, or in person at Fleetway House or Tallis House.

### THE NEW TRANSFORMER.

L. A. (Warrington).—"Honestly, I did not believe all this about better and better instruments, for I was so satisfied with my old set that I was reluctant to alter. However, one day it went west, and the dealer told me it was a burnt-out primary of the low-frequency transformer. I wanted another one of the same kind, which was a 5 to 1, but he insisted that I should like a 3 to 1 much better, and that it would be louder than the 5 to 1. As we could not get one like the first, I gave way and he put in a 3 to 1.

"The improvement was phenomenal. Even at its best the old set never brought out the tone of the orchestra as it is now doing. But what puzzles me is that I get both greater power with the smaller ratio, with a greater clarity on the high notes and deeper low notes. What makes all that difference between the transformers?"

There has been a steady improvement of late in low-frequency transformers, both in design and in material. One trouble with the old 5 to 1 type was that the primary winding was rather small (it had to be, owing to the high step-up), and it therefore had a low impedance which was especially harmful to low-frequency impulses that tended to pass through the transformer without producing the full effects upon the secondary.

By reducing the ratio of the transformer the primary impedance could be increased, and this would improve the low notes, as stated. But the improvement in the high notes is probably due to a better secondary.

In your old transformer you probably had quite a large secondary winding between the turns of which existed a considerable capacity. This was little disadvantage on low notes, but on the higher musical frequencies, such as piccolo, piano, violin, etc., such distributed capacity would offer a by-pass to the high-frequency impulses, and would result in your transformer cutting off much of the "top stuff."

Add to the above the improvements in the core, and you will understand the great advance which is now being demonstrated to you by your own set.

### TAPPING THE TUNING CIRCUIT.

"EXPERIMENTER" (Kings Langley).—"I have been greatly surprised at the results from a tapped coil tuned by a ·0005 mfd. Not only the aerial is tapped down the coil, but the return from the crystal, instead of being joined to the tuning condenser, is tapped also by means of a clip.

"Could this be done to a valve set in the same way, and, if so, what are the connections for a one-valver?"

The benefit of tapping the output connection into a tuned circuit, as well as the aerial connection, is not so great in the case of a valve set as in that of a crystal, but often enables a perceptible improvement in selectivity to be obtained.

You can easily experiment on these lines, using about 55 turns of No. 22 or 24 D.C.C. wire for the tuned circuit coil, on a 3-inch diameter former. Close beside it you will need 30 turns of No. 32 D.S.C. for reaction and, in addition, the necessary parts for a one-valve set.

Connections will be: aerial terminal to a tapping clip which goes on to the coil (the latter is tapped at every 5 turns on the tuning portion). The earth terminal is joined to one end of the tuning coil and one end of the reaction coil, to the moving plates of the ·0005 mfd. variable condenser, to L.T.—, H.T.—, and to one side of the filament.

The remaining filament terminal on the valve holder goes to one side of the grid leak and to an L.T. switch. The remaining side of the switch goes to L.T. +.

The grid socket on the valve holder goes to the remaining side of the grid leak, and to a ·0003 mfd. fixed condenser. The other side of this condenser is provided with a flexible lead and tapping clip which can be taken to the tuning coil.

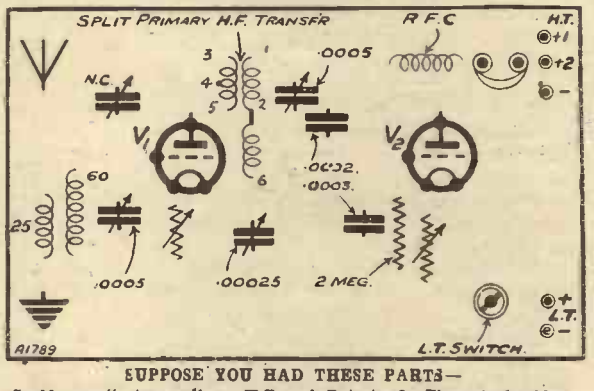
The other end of the tuning coil goes to the fixed vanes of the variable condenser. The remaining end of the reaction winding goes to a ·0001 mfd. variable condenser, and the fixed plates of this go to the plate socket of the valve holder and to H.F. choke, preferably via a fixed condenser of ·001 mfd. (or thereabouts) capacity.

Finally, the remaining side of the H.F. choke goes to 'phones, and the other 'phone terminal goes to H.T. +. Use one of the H.F. types of valve, and experiment with H.T., etc., until the position of the grid clip, and also the aerial clip, is such that the set slides in and out of oscillation without the slightest trace of "plop."

You will find this an excellent long-distance receiver.

(*Continued on next page.*)

## POPULAR "WIRELETS" No. 11




**SUPPOSE YOU HAD THESE PARTS—**

**Could you "wire up" an H.F. and Detector? The set should be extremely sensitive on 'phones and perfectly stable when neutralised.**

**LOOK OUT FOR THE ANSWERING DIAGRAM NEXT WEEK.**

# RADIOTORIAL QUESTIONS AND ANSWERS

*(Continued from page 329.)*

### FAULTY REACTION.

G. N. L. (Glasgow).—"The only fault is that reaction bursts in. Just as I am getting a distant station, there is a 'plop,' and then the reaction condenser has to be retarded through 3 or 4 degrees before the set stops oscillating. What can I do with that?"

This particular trouble is called overlap, and is generally due to incorrect H.T. on the detector, incorrect grid leak values, incorrect size of reaction coil, or wrong value of grid condenser.

Try the effect of a different grid leak and different reaction coil size, experimenting at the same time with higher and lower voltages on H.T. +. If this fails to cure, increase the value of the grid leak by placing another in series with it, or decrease it by connecting another in parallel, if you have one on hand; or if possible, borrow different values until you find which one suits the set.

(If yours is a very stubborn case, it may improve it to vary the capacity of the condenser by adding another condenser in parallel or in series with it; but this is seldom necessary, provided the other points named are carefully watched.)

### MORE NOISY RECEPTION.

S. K. (Norwich).—"What would be the cause of noisy reception in an amplifier? With the same aerial and earth, and 'phones in the detector valve, reception is absolutely clear, but when I connect up the amplifier there is a constant background of noise. What is that?"

We could have been much more definite if you had told us the type of amplifier you are using. For instance, in transformer-coupled amplifiers the transformer itself is often the cause of noises of this class. Defective insulation may be the trouble, but it is probably not an actual break in one of the windings, for when this happens signals become very weak, or perhaps disappear altogether, in addition to the constant frying or sizzling. (Sometimes short bursts come through at much reduced strength and then disappear altogether.)

If you are using a resistance-capacity coupling, any defect in the anode resistance may cause irregular amplification, due to the voltage variation across it. It is important that the coupling condenser in this class of amplifier should be above suspicion, for if it is in any way leaky the plate voltage of the preceding valve is partially applied to the grid of the following valve.

Generally this particular condenser fault stops signals altogether, but it may cause unexpected fluctuations and noises, and in this case it will result in an heavier than necessary drain upon your H.T. battery. The same voltage variation effects may apply in the case of a faulty grid leak, although generally this is not so troublesome as an anode resistance in this class of amplifier.

If you are using a low-frequency choke, you may get results either like the transformer trouble or resembling those with R.C., for the circuit conditions partly resemble both when a choke is used. Do not forget, too, that likely causes of this class of disturbance are variations in the filament current supply, due to imperfect contact, a poor connection in the H.T. battery, or an imperfect contact in the grid-bias battery.

These may be in the external leads joining up the batteries or in the batteries themselves; and, in the case of an accumulator, an imperfect contact often occurs where the strip connecting one section of the battery to the next is allowed to become loose.

## TECHNICAL TWISTERS

### No. 12.—CRYSTAL DETECTORS.

CAN YOU FILL IN THE MISSING LETTERS?

The mineral most commonly used for crystal detectors is . . . . . .

Some crystals require only a . . . . . contact, and others a comparatively . . . . . one.

The contact may be made with another . . . . . or by a springy wire called the . . . . . .

The advantage of using a gold . . . . . is that it does not . . . .

Last week's missing words (in order) were: Heaviside Layer; Distant (or Foreign); Long; Night, Day; Sunrise, Sun-set.

## WHAT DO *YOU* THINK ABOUT THIS?

The "Magic" Two was the first set he had made, but, being a P.O. electrician, used to soldering, he was confident that he could make a good job of the wiring. Components were all good ones, (tested before use) all flexible leads were provided with well-fitting plugs, spade terminals, etc., aerial and earth beautifully wired, and all the wiring checked zealously. (Six-volt valves and loudspeaker were employed.)

Yet when switched on (good contact at switch) results were "fady" and uncertain, and everything pointed to a bad contact somewhere. He soon found it, of course, but can YOU think

WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to above next week.)

*Last week's poser from Colchester proved to be a weak spot in the flexible lead from the grid of the detector valve.*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MODEL W.5. *Incorporates Westinghouse Metal Rectifiers on both H.T. and L.T. sides.*
SIZE—9" × 5" × 3½". OUTPUT—120 Volts at 15 m/a.
TAPPINGS—H.T., 2 continuously variable (one S.G.) and 1 Power. L.T.—Trickle Charger for 2-, 4- or 6-volt Accumulators.

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MODEL W.6. H.T. only, £4 : 5 : 0.

*Either of the above models is available for 25 cycles at an increase in cost of 10/-.*
*If supplied with "Xtra-Point" Lamp-holder and Plug, 4/6 extra.*

THEY FIT INSIDE ANY PORTABLE

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—the only "Portable" Combined D.C. Unit on the market.

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H.T. OUTPUT—130 volts at 20 m/a.
H.T. TAPPINGS—2 continuously variable (one S.G.) and 1 power.
L.T.—Trickle Charger for 2- 4- or 6-volt accumulators, without any alteration whatever to existing wiring.

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Prices: Oak Cabinet, £25.4s. cash, or £2.7s. down and 11 equal monthly instalments. Mahogany or Walnut Cabinet, £26.5s. cash, or £2.9s. down and 11 equal monthly instalments.

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Lotus Works, Mill Lane,
Liverpool.

Causton

## FOR THE LISTENER.

(*Continued from page 318.*)

make out. And the signalman was far too busy to tell us.

But somebody might have done. We were warned to expect the famous train, The Corridor, to pass through the station. It may have done. I don't know.

Like Wish Wynne's old lady taking a child to the circus, "I don't know, my dear, I don't know!" I like noises when I know what they mean; but not noises that may have any meaning, like the creak on the stair which may be a burglar!

**The Man of Destiny.**

I liked this. Shaw broadcasts well. The action is nothing. The ideas and the fun are everything. I heard every word, which is not always the case in broadcast plays.

This is apparently one of Mr. Cecil Lewis's great points in production (for it was conspicuous in the dialogue parts of "Dorothy") that the words must be audible.

A very good point, too. Other producers please copy. Laura Cowie has almost a perfect microphone voice. You could hear her gestures almost! The play is a "trifle." It verges on farce.

Who ever heard of a sub-lieutenant talking like that to a general? But the skeleton matters little; it is the flesh and blood that Shaw puts on it that counts.

**Nightingales.**

Inspired by Julian Huxley's talks on "Bird-Watching," I walked out two miles the other night to the corner of the road where there is a little copse. It was 10.30. Usually it is a lonely spot.

There were six motor-cars already there, and men and women in evening dress. She sang to us for about an hour. She was in full sight, her trim little body silhouetted against the starlit sky. We were near enough to see her glorious throat quiver as she warbled.

Afterwards a charming creature shared her thermos with me; and, fortified by human kindness and that noble song, I trudged home and to bed.

**Corelli.**

No, not Marie! Much better! It has been one of the pleasures of my week to listen to Eda Kersley playing Corelli's violin music. I like these "foundations of music"; I find I can understand them better than many of the superstructures which have been raised upon them.

Eda Kersley has a beautiful bow, and the sweetness of her tone and the breadth of her phrasing were delightful. And I lost my heart again for the umpteenth time to Miriam Licette and her lovely songs. She almost made me forget the nightingale!

**Nansen.**

The B.B.C. did well to get Professor Gilbert Murray to speak a eulogy upon this very great man, this "brave, good, compassionate man," as Murray called him who had been his friend. In that simple, almost Grecian, manner which is so characteristic of Professor Murray, we were told of the arctic explorer, of the man who fought the Russian famine, who repatriated no fewer than 450,000 prisoners lost in Russia during the war, and of one who was "always the friend of England."

## BROADCASTING THE DERBY.

(*Continued from page 311.*)

an early Derby broadcast. It was arranged to give the commentary from the flat roof of the new part of the stand, almost immediately above the Royal Box. A cinematograph operator showed a remarkable acrobatic agility in manœuvring for a good position, and actually sat on the edge of the roof with his legs dangling over the side.

The fact that he might drop unexpectedly into the Royal Box did not trouble him in the least, but the Epsom authorities decided to take no further risks. For this reason the B.B.C. were given their new position in the Press Gallery.

Simple as the present broadcasting arrangements are, nothing is left to chance. Even the simplest of schemes "gang aft a-gley." A rehearsal is held on the day before the race, and any technical adjustments required are made then.

**Difficult to Describe.**

On account of the short space of time in which it is run, the Derby is a very difficult race to describe. Even from the broadcasting stand (one of the best viewpoints obtainable) the horses disappear going down the hill, and, as they round the famous Tattenham Corner, it needs an eagle eye to distinguish any particular colours in the general cluster.

Consequently, one might say that the success or failure of the Derby broadcast depends almost entirely on the ability of the commentator. This, it must be admitted, is something of a disadvantage, for even the best of microphone speakers are apt to have their good and bad periods.

For all that, I think that most listeners will agree that the commentators we have so far had have got through their task in a most efficient manner. And maybe the day is not far distant when we shall be able to watch the Derby from our home armchairs.

## TECHNICAL NOTES.

**By Dr. J. H. T. ROBERTS, F. Inst. P.**

PROBABLY one of the most frequent kinds of enquiry I receive from readers relates to increasing the range of reception of the set. I suppose the fact is that amateurs usually start out with a set of limited range and, after getting a taste for radio, they then naturally wish to reach out and bring in more distant stations.

It is commonly stated that the high-frequency amplifying part of the set is the one which takes care of distance of reception, whilst the low-frequency amplifying part looks after the volume of the reproduction.

In a general way this is true, but at the same time the functions of the H.F. and L.F. amplifiers to some extent overlap. That is to say, if a certain station is received only faintly, an increase in the L.F. amplification will bring the volume of the station up and, for practical purposes, "bring it in."

(*Continued on page 334.*)

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Telsen "Ace" the Ideal Transformer for Portable Sets and all sets where space is limited. Made in ratios 3-1 and 5-1. Price 8/6.

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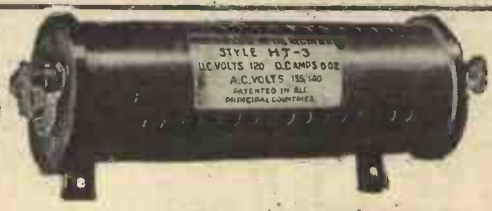


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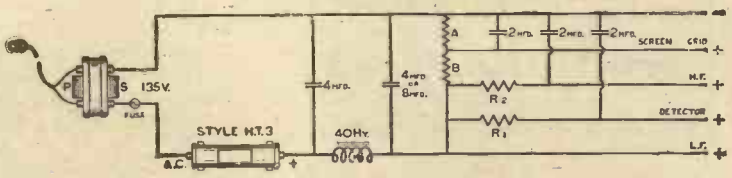


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# TECHNICAL NOTES.

(*Continued from page* 332.)

**Detection of Signals.**

What is really meant by saying that the H.F. controls the distance of reception is that the detector must receive signals of a certain strength before it can be effectively operated.

If the signals, when they arrive at the detector, are below the necessary strength, they will not operate the detector properly, and no amount of L.F. amplification thereafter will really compensate for the deficiency.

Again, even supposing a suitable amount of H.F. amplification is used and the signals arrive at the detector of ample strength, the detection may be satisfactorily accomplished, but unless there is a proper amount of L.F. amplification the signals will not be sufficiently loudly reproduced from the speaker.

Therefore, it is fairly safe to act on the above-mentioned principle that H.F. takes care of distance and L.F. of volume, although, as I say, to a certain extent either may serve the functions of the other.

**Adding H.F.**

In order to add high-frequency amplification to the set, if you are making up the H.F. stages yourself, you require variable condensers up to a capacity of, say, ·0005 and coils between, say, 25 and 250.

As you know, under proper conditions, great advantage in amplification is to be obtained by the use of screened-grid valves. It is perhaps unnecessary to mention the small fixed condensers and high-frequency chokes as part of the H.F. amplifying system and the necessary controls.

On the low-frequency amplifying side there is still a great deal to be said for transformer coupling and, personally, I prefer this type of L.F. coupling for all-round purposes, notwithstanding some of the admitted advantages of the alternative methods.

**H.F. in Portables.**

Before leaving this matter, I should like to mention one point which, although very well known to experienced experimenters, seems often to puzzle newcomers to radio. Frequently I receive letters from readers who wish to make a portable or semi-portable set, that is, one completely self-contained without aerial or earth, and who do not seem to realise the necessity for additional H.F. amplification in such a case.

The moment you dispense with an outside aerial or, in fact, with any extended aerial at all, as you do with a completely self-contained set, you start off with a very small fraction of the incoming signal energy which you would otherwise receive. Naturally this has to be compensated by additional H.F. amplification.

It is often computed that an outside aerial is equal to at least two ordinary H.F. stages; that is to say, if you do away with the outside aerial and substitute a frame aerial in the cabinet of, say, a foot square, it will take at least two ordinary H.F. stages to make the set equally sensitive.

**Designing a Set.**

In view of the very greatly increased H.F. amplification which is now obtainable with screen-grid valves, the design and

(*Continued on next page.*)

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# TECHNICAL NOTES.

*(Continued from previous page.)*

construction of portable sets—or, for the matter of that, of any other kind of compact sets—has been greatly simplified.

I think many beginners in radio fail to realise the great value of a really efficient outdoor aerial. It is true that an aerial and earth system is often troublesome and inconvenient to erect and maintain, and the counter-advantages of a self-contained or portable set are very obvious.

But, as in other matters, you cannot have it both ways, and if you want to avoid the use of aerial-and-earth you have to pay for it in the shape of increased high-frequency amplification.

In fact, for the standard radio receiver which is not intended to be moved about, I would recommend a good outdoor aerial every time.

### Impedance Relations.

I have received many queries at different times with regard to the relative values of impedance of, for example, a transformer and a valve working in conjunction with it, or transformer output and loud-speaker input, and so on.

As practically the same considerations enter in all these cases of matching or correctly proportioning impedances, it will perhaps be simpler to give a short outline of the principles involved.

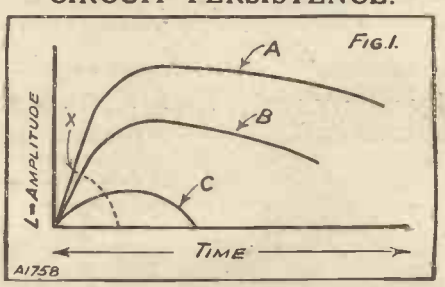
### A General Principle.

In the first place, I should say that there is a general electro-technical principle that where two circuits are to be associated together so that power will be automatically transferred from the one to the other, the maximum wattage under given conditions will be transferred when the impedances of the two circuits are the same or, to be more correct perhaps, I should say that the transfer will then be effected with the minimum loss of energy in the process.

In a particular case it has been shown that when the output impedance was only half the input impedance, a loss of about 12 per cent. occurred in the power transferred, and this loss rose very rapidly so that when the output impedance was one-quarter of the input impedance the loss was about 40 per cent. whilst when the output impedance was only one-fifth of the input impedance the loss was 45 per cent., rising to nearly 70 per cent. when the output impedance was one-tenth of the input impedance.

*(Continued on next page)*

## CIRCUIT PERSISTENCE.




In our May 17th issue we described this diagram as illustrative of "Sir Ambrose Fleming's theory." Actually, of course, Circuit Persistence is one of the main features of Dr. Robinson's new Stenode theory

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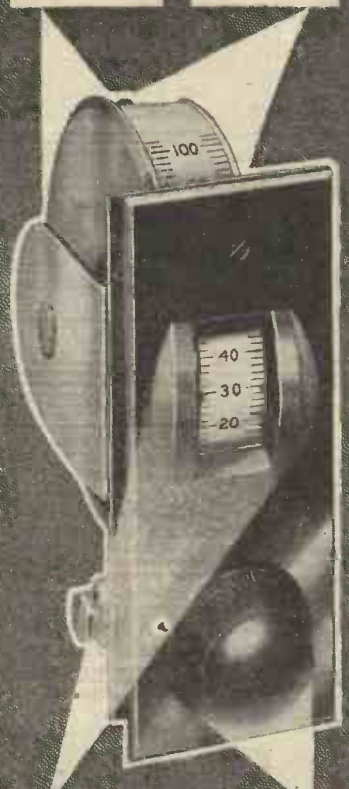
All parts of the Dial are insulated from the Condenser, so that the drum becomes an anti-capacity shield and may be earthed.

The scale is Ivorine reading 0-100, and is reversible so that reading may be altered to 100-0




The scale is flush with the panel, making it exceptionally easy to read. The powerful friction drive prevents backlash and slip.

By a patented method the Control Knob is placed immediately below the scale—the most convenient place for it.

*Advertisement of Jackson Brothers, 72, St. Thomas' St., London, S.E.1. Telephone: Hop 1837.*

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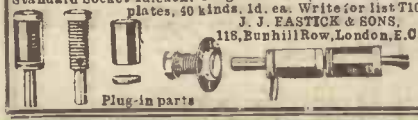
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## TECHNICAL NOTES.

*(Continued from previous page.)*

This explains why it is advantageous to have the output impedance of a transformer equal to the impedance of the loudspeaker which it is supplying. According to the figures I have just mentioned there will be a 10 per cent. loss if the one is twice the other.

**A Special Case.**

There is one important case, however, which I should mention. I refer to the relation of the impedance of a valve to that of the next component following it, for example, the transformer.

Here, as you know, the impedances should *not* be equal, and, in fact, it is a rough-and-ready rule to arrange for the impedance of the transformer (or whatever it may be) to be about double that of the valve.

At first sight this seems to be contrary to the general electro-technical principle which I mentioned above. As a matter of fact, it is a deliberate departure from the above rule, as by so doing we get better quality and avoid distortion.

Since quality is much more important in a radio receiver than comparatively small power considerations, it is worth while to depart from the optimum power conditions, so long as we gain in the quality of reproduction.

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**Impedance Relations.**

The relationship between the value of the anode resistance and the impedance of the valve, in a resistance-coupled intervalve circuit, is a point upon which amateurs often seem to be in doubt.

As a matter of fact, the best possible relationship depends on a number of factors, and differs in different cases, but for general purposes it is a simple plan to allow a value for the anode resistance of at least five times the impedance of the valve. The following grid leak should have a resistance at least twice that of the anode resistance.

To take a case in point, if the valve has an impedance of, say, 15,000 ohms, the anode resistance should be, say, 70,000 to 80,000 ohms, whilst the grid leak of the following valve should have a resistance of, perhaps, 200,000 ohms.

The question as to whether it is better to use a transformer in the first stage of the amplifier, rather than a resistance-capacity coupling, is one which depends on circumstances.

In the advertisement which appeared on page 307 of "P.W." last week, the Formo-Dunsor exclusive features should have read :—Concealed Internal Flexible Connection, Self-Oiling Shafts, Lowest Electrostatic Loss, Lowest Dielectric Loss, Nearest Approach to Air Suspension, Silky Action.


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V. 37

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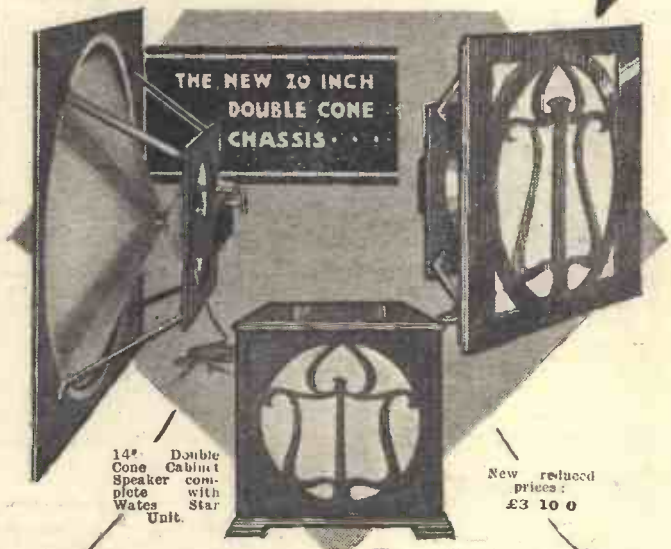


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Silk-lined fret in polished wood, for 12" chassis, 4/-, for 14" chassis, 5/-.

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# WATES UNIVERSAL DOUBLE CONE CHASSIS

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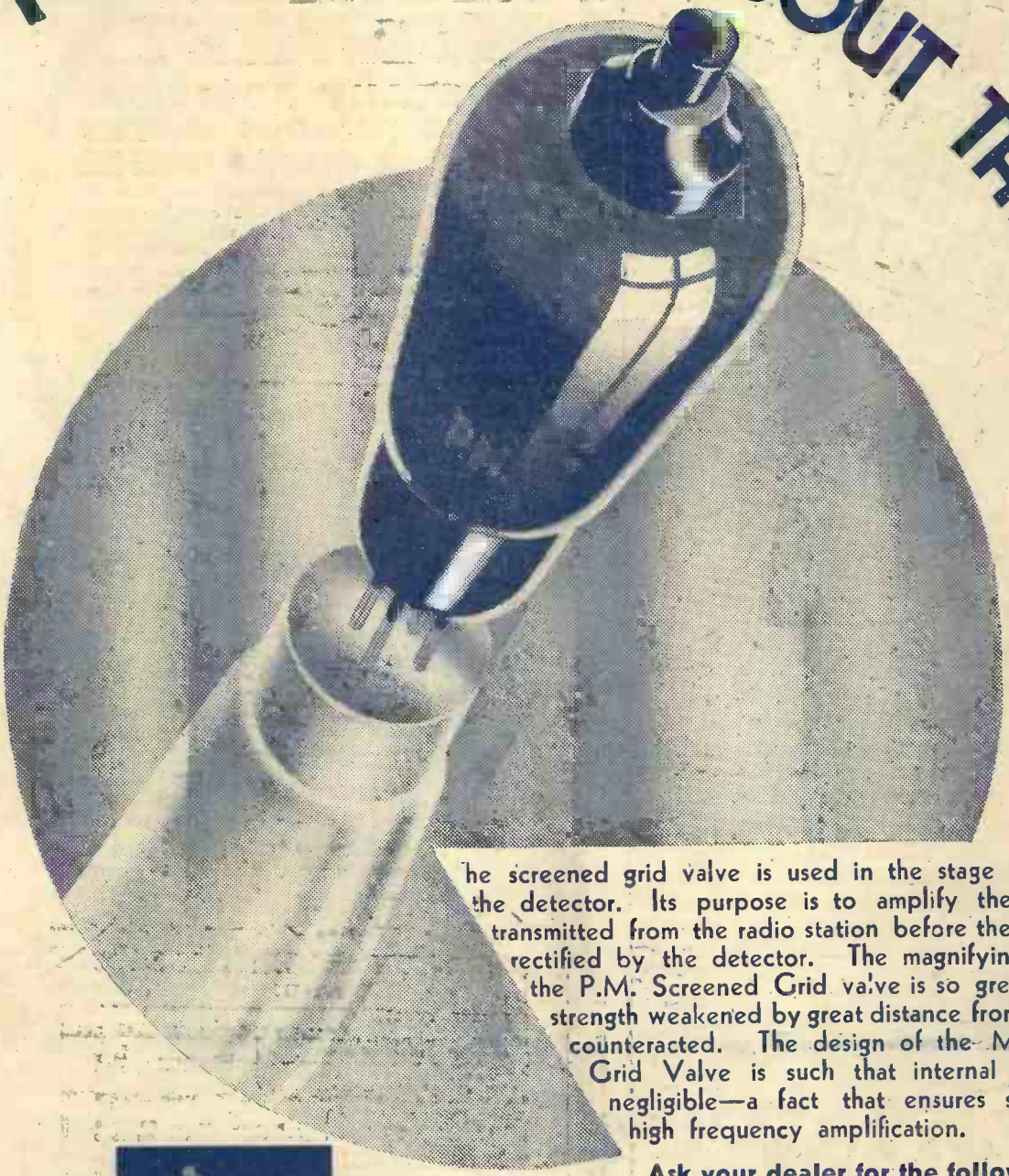
M.8.

# PLAIN FACTS ABOUT THE SCREENED GRID



The screened grid valve is used in the stage before the detector. Its purpose is to amplify the signals transmitted from the radio station before they become rectified by the detector. The magnifying power of the P.M. Screened Grid valve is so great that signal strength weakened by great distance from transmitters is counteracted. The design of the Mullard Screened Grid Valve is such that internal capacity is almost negligible—a fact that ensures stable and efficient high frequency amplification.

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*Above, an illustration showing the filament inside a Mullard Screened Grid valve. The thin thread-like filament represents the result of continuous and concentrated experiment in the Mullard Laboratories.*

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